Original Article

Some Hand Anthropometry among Babur/Bura and Kanuri Ethnic Groups of Borno State, Nigeria

[1]Ishaku, B., [1]Timbuak, J.A. and [1]Hamman, W.O.

Abstract

BACKGROUND AND AIM: The human hand is the most used and versatile part of the body, and its dimensions varies with age, sex and ethnic groups. Hand dimensions such as, hand length and hand breadth are useful in forensic and legal sciences. The aim of this study is to measure some hand anthropometry variation among Babur/Bura and Kanuri ethnic groups in Maiduguri, Borno state Nigeria.
METHODOLOGY: A total of eight hundred and one (801) subjects (401 males; 198 Babur/Bura, 203 Kanuri and 400 females; 198 Babur/Bura, 202 Kanuri) were recruited for this study. Parameters collected were: hand length (HL), palm length (PL), hand breadth (HB) and palm breadth (PB) using a palm print scanner (HP Deskjet 1515 model) and, compared between groups student's *t*-test was used, discriminant function was used to predict sex. SPSS version 22.0 software was used for statistical analyses and *P*<0.05 was set as level of significance.
RESULTS: Data analyzed showed that, Babur/Bura and Kanuri males had higher (p<0.001) mean hand dimension values compared to their female counterparts. However, there was no difference (p>0.05) in hand dimensions between the male-to-male and female-to-female of both ethnic groups.
CONCLUSION: There was sexual dimorphism in hand dimensions amongst Babur/Bura and Kanuri ethnic groups, which, could be useful for determination of sex and provide more insight into biological variation with the inclusion of these groups.

Keywords:
Hand length, hand breadth, palm length, palm breadth, Babur/Bura, Kanuri.

[1]Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Ahmadu Bello University, Zaria, Nigeria.

Address for Correspondence:
Ishaku, B.
Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Ahmadu Bello University, Zaria, Nigeria.
barkaishaku@gmail.com
+2347061391775

INTRODUCTION

Anthropometry is the study of human body measurements. Personal identification, ascertaining sex, ethnic and population variations from body dismembered and human remains has become theme in medical, education and anthropometric studies. Sex identification is often considered as one of the simplest tasks in forensic investigation when the whole body is available as the external and internal genitalia can directly suggest the sex of the individual (Varu *et al*., 2016). In forensic investigation, dismembered body parts are frequently found due to natural and man-made disasters such as homicide, suicide, terrorist attack, earthquake, car accident or in definite situations where the mutilation of dead body is done by murderer to destroy all traces of identity (Varu *et al*., 2016). It is common to recover dismembered and peripheral parts of the body (Dey and Kapoor,

2015). Forensic anthropologists can use various anthropometric techniques to determine sex and ethnicity from such dismembered body parts.

The human hand being the most used and versatile part of the body and the hand dimensions vary in different age, sex, race and ethnic groups and this may be attributed to biological and environmental factors. It is also of great scientific importance to investigators in the field of anthropometry, forensic pathology, orthopedic surgery, ergonomics and legal sciences (Tarsem and Vishram, 2015; Mahrous *et al.,* 2016). Importance of morphometric and skeletal examination of hand and foot dimensions in identification has been reported previously (Jasuja and Singh, 2004; Habib and Kamal, 2010; Ozaslam *et al*., 2012; Patel *et al*., 2014; Chandra *et al*., 2015; Kumar and Singh, 2015; Pandey, 2015). Studies using hand measurements for sex determination

have been reported by Danborno and Elukpo (2008), Kanchan and Rastogi (2009). However, Sexual dimorphism in the hand dimensions among ethnicity and populations has become theme of interest to anthropologist (Danborno, 2007; Aboul-Hagag *et al.*, 2011; Numan *et al.*, 2013; Mahrous *et al.*, 2016; Viskas *et al.*, 2016).

The Babur/Bura and Kanuri are large ethnic groups of Borno State, but data on their human biology is scarce. The present study intends to identify some hand anthropometry among the Babur/Bura and Kanuri ethnic group. The study could provide biological data on Babur/Bura and Kanuri ethnic groups and establish reference data on hand dimensions which could be of value to researcher, forensic scientists, and law enforcement agents where there is need for identification.

MATERIALS AND METHOD

Ethical approval: Ethical approval for the study was obtained from Ahmadu Bello University Committee on Use of Human Subject for Research with ethical clearance number ABUCUHSR/2018/003. Also, data were obtained under informd consent.

Study Location: Kanuri and Baur/Bura are large ethnic groups of Borno State, situated in the North-East region of Nigeria. Maiduguri which is locally called 'Yerwa' is the capital of Borno State. Borno State is located between latitudes 10° and 14° N and longitudes 11° 30' and 14° 45' E, bordered by Republics of Niger to the North, Chad to the North-East and Cameroon to the East.

Sample size: The study was carried out using randomly sampling technique, selected healthy individual of ages between 17-30years. We proceed to the field taking all the precaution to obtained absolute data. The sample size for the study was determined using the sample formular by Naing *et al.* (2006).

$$n = \frac{Z^2 pq}{d^2}$$

Where:

n= Minimum sample size
Z= Standard normal deviation 1.96 at 95% confidence level
P= Proportion of the target population 50% (0.5)
Q= 1-P, 1-0.5= 0.5
D= Sample error which is 5% (0.05)

$$n = \frac{1.96^2 * 0.5 * 0.5}{0.05^2}$$

n= 384

A total of eight hundred and one (801) subjects (401 males; 198 Babur/Bura, 203 Kanuri and 400 females; 198 Babur/Bura, 202 Kanuri) were recruited for this study. Questionnaire was distributed for determine subject tribe,

the participant father, mother, grandfather, grandmother are Babur/Bura by tribe was included in the study and the same applied to the Kanuri participants. The study was conducted in College of Nursing and Midwifery and College of Health and Technology Maiduguri Borno State, Nigeria.

Anthropometric methodology: The individuals used were apparently healthy without any hand deformities and who gave informed consent. We ran a pre-test of 30 subjects 15males and 15females using sliding caliper we took the measurement of the hand dimensions and from the same person we scanned his/her hand and took the measurement then compare and we got equal to the real time measurements in humans. Hand dimensions participants were asked to place both hands on Hp Deskjet 1515 connected to laptop both hands were scan and saved on the laptop, Corel Draw X3 was used for hand measurement in centimeter.

The hand dimensions were as follows:

- **Hand length:** a measurement taken as straight line from distal crease of the wrist joint to the tip middle finger.

- **Hand breadth:** a measurement taken as straight line from most medial set point to most lateral set point including the thumb.

- **Palm length:** a measurement taken as straight line from distal crease of the wrist joint to distal metacarpophalangeal crease of middle finger.

- **Palm breadth:** a measurement taken as straight line from most medial to most lateral excluding the thumb.

Statistical analysis: The data were compared between group using student's *t*-test, Statistical Package for the Social Sciences version 22 software was used for statistical analyses and $P<0.05$ was set as level of significance.
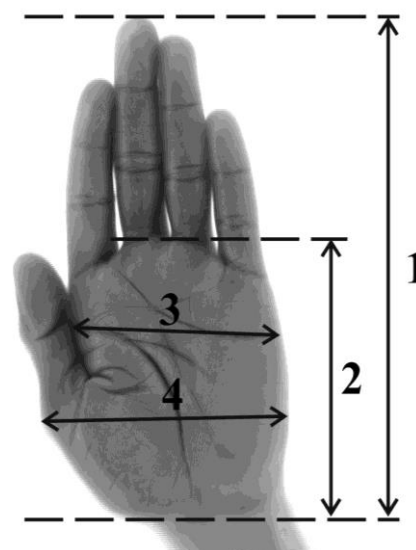

Figure 1: 1. Hand length, 2. Palm length, 3. Palm breadth, 4. Hand breadth.

RESULTS

Table 1 show descriptive statistics of the entire sample population the mean, standard deviation, minimum and maximum age, right and left hand length and breadth, and tri-radii angles of both the hands.

Tables 2 is a comparison of variable between the males of the two ethnic groups, the Babur/ Bura males have significantly higher values in most of parameters than the Kanuri males which showed statistically significant (right hand breadth, left hand breadth, left palm breadth and left AT) at p-value<0.01. Similarly in table 3 the Babur/Bura females have significantly

higher values than the Kanuri females in most of the parameters which showed no significant difference, however, the left-hand breadth shown the p-value<0.03.

Tables 4 and 5 is a comparison studies in hand dimensions (Hand length, palm length, hand breadth, palm breadth) showed that the males Babur/Bura had higher mean values compared to their females and these differences in sexes were statistically significant (p<0.001). Likewise for the Kanuri ethnic group, hand dimensions the studies showed that the males had higher mean values compared to their females and these differences in sexes were statistically significant (p<0.001).

Table 1: Descriptive statistic of all studied parameters for both sexes

Variables	Females (n=400) Mean±SD	Min	Max	Males (n=401) Mean±SD	Min	Max
RHL (cm)	18.17±0.98	14.94	21.59	19.23±0.98	16.38	21.59
RPL (cm)	10.45±0.59	8.85	12.45	11.04±0.60	8.91	12.45
RHB (cm)	9.22±0.64	7.27	11.27	10.05±0.60	8.32	11.62
RPB (cm)	7.41±0.55	5.81	9.11	8.10±0.55	6.62	10.48
LHL (cm)	18.22±0.99	15.07	21.42	19.31±0.99	16.31	21.59
LPL (cm)	10.49±0.59	9.04	12.40	11.10±0.60	8.98	12.41
LHB (cm)	9.15±0.80	6.67	19.37	9.98±0.60	8.36	11.66
LPB (cm)	7.32±0.54	5.63	9.51	8.05±0.53	6.57	9.94

RHL= Right hand length, RPL= Right palm length, RHB= right hand breadth, RPB= right palm breadth, LHL= left hand length, LPL= left palm length, LHB= left hand breadth, LPB= left palm breadth,

Table 2: Comparison of variables between males of the two ethnic groups

Variables	Babur/Bura Male(n=198) Mean±SD	Kanuri Males(n=203) Mean±SD	t-value	p-value
Right Hand Length (cm)	19.27±1.04	19.19±0.91	0.77	0.44
Right Palm Length (cm)	11.07±0.61	11.02±0.59	0.78	0.44
Right Hand Breadth (cm)	10.13±0.60	9.97±0.59	2.76	**0.01**
Right Palm Breadth (cm)	8.15±0.54	8.06±0.56	1.71	0.09
Left Hand Length (cm)	19.37±1.05	19.25±0.91	1.15	0.25
Left Palm Length (cm)	11.13±0.62	11.06±0.58	1.26	0.21
Left Hand Breadth (cm)	10.06±0.61	9.90±0.59	2.66	**0.01**
Left Palm Breadth (cm)	8.12±0.52	7.98±0.54	2.51	**0.01**

Table 3: Comparison of variables between females of the two ethnic groups

Variables	Babur/Bura Females(n=198) Mean±SD	Kanuri Female(n=202) Mean±SD	t-value	p-value
Right Hand Length (cm)	18.23±0.93	18.11±1.03	1.19	0.24
Right Palm Length (cm)	10.52±0.55	10.41±0.62	1.87	0.06
Right Hand Breadth (cm)	9.28±0.62	9.16±0.65	1.89	0.06
Right Palm Breadth (cm)	7.46±0.53	7.36±0.57	1.75	0.08
Left Hand Length (cm)	18.29±0.94	18.16±1.03	1.30	0.20
Left Palm Length (cm)	10.55±0.55	10.44±0.60	1.97	0.05
Left Hand Breadth (cm)	9.24±0.93	9.07±0.64	2.17	**0.03**
Left Palm Breadth (cm)	7.36±0.50	7.28±0.57	1.47	0.14

Table 4: Sexual Dimorphism of the Studied Variables in Kanuri Subjects

Variables	Females (n=202) Mean±SD	Males (n=203) Mean±SD	t-value	p-value
Right Hand Length (cm)	18.11±1.03	19.19±0.91	-11.17	<0.001
Right Palm Length (cm)	10.41±0.62	11.02±0.59	-10.15	<0.001
Right Hand Breath (cm)	9.16±0.65	9.97±0.59	-13.03	<0.001
Right Palm Breath (cm)	7.36±0.57	8.06±0.56	-12.46	<0.001
Left Hand Length (cm)	18.16±1.03	19.25±0.91	-11.33	<0.001
Left Palm Length (cm)	10.44±0.60	11.06±0.58	-10.54	<0.001
Left Hand Breath (cm)	9.07±0.64	9.90±0.58	-13.71	<0.001
Left Palm Breath (cm)	7.28±0.57	7.98±0.54	-12.67	<0.001

Table 5: Sexual Dimorphism of the Studied Variables in Babur/Bura Subjects

Variables	Females (n=198) Mean±SD	Males (n=198) Mean±SD	t-value	p-value
Right Hand Length (cm)	18.23±0.93	19.27±1.04	-10.53	<0.001
Right Palm Length (cm)	10.52±0.55	11.07±0.61	-9.46	<0.001
Right Hand Breath (cm)	9.28±0.62	10.13±0.60	-13.84	<0.001
Right Palm Breath (cm)	7.46±0.53	8.15±0.54	-12.95	<0.001
Left Hand Length (cm)	18.29±0.94	19.37±1.05	-10.79	<0.001
Left Palm Length (cm)	10.55±0.55	11.13±0.62	-9.89	<0.001
Left Hand Breath (cm)	9.24±0.93	10.06±0.61	-10.32	<0.001
Left Palm Breath (cm)	7.36±0.50	8.12±0.52	-14.78	<0.001

DISCUSSION

Hand dimensions provides pertinent area of research to biological anthropologist interested in studying variation within and between populations, reference, and biological data for sex identification.

In our study the average mean values in hand dimensions for Babur/Bura and Kanuri ethnic groups was established, and these values are not different from the studies earlier report by Danborno & Elukpo, 2008, Ibeauchi *et al*., 2011, Aboul-Hagag *et al*., 2011, but the average mean values slightly higher than that obtained by Numan *et al*., 2013, and lower mean values obtained by Anas *et al*., 2010. These values will be useful for sex identification, forensic investigation, clinical practice, and in ergo-design applications of hand tools and devices (Ibeauchi *et al*., 2011).

The present study among the Babur/Bura and Kanuri ethnic groups confirms sexual dimorphism in the hand dimensions as earlier reported by Danborno & Elukpo, 2008; Kanchan and Rasogi, 2009; Aboul-Hagag *et al.*, 2011; Numan *et al.*, 2013; Dey and Kapoor, 2015; Goswami *et al.*, 2016; Mahrous *et al.*, 2016; Viskas *et al.*, 2016. Furthermore, on differences in hand dimension between the male and female in the studies could be explained as part of genetic factors of male being larger than female, and in addition to differences in body dimension in sexes, population and ethnicity could be as a result of differences in level of physical activity, nutrition etc. (Malina, 1994, Dubois *et al.*, 2012). When comparison was made between the two ethnic groups, the male Babur/Bura have longer and wider hand than male Kanuri, and similar between the females   this could be due to fact that body dimension is influenced by hereditary, nutritional, climate and racial factor (Rastogi *et al.*, 2008).

Conclusion

Sex and ethnic identification could be achieved using anthropometric measurements of hand dimensions. For this study, anthropometric measurement of hand dimensions was identified as more reliable predictor of sex.

Acknowledgment

Conflicts of interest

There are no conflicts of interest.

REFERENCES

Aboul-Hagag K.E., Mohamed S.A., Hilal M.A., Mohammed E.A. (2011). Determination of sex from hand dimensions and index/ring finger length ratio in upper Egyptians. Egypt J Forensic Sci 1:80-86.

Anas I.Y., Esomonu U.G., Zagga A.D. (2010) Prediction of stature of Hausa ethnic group using hand length and hand breadth. J of med in the tropics.;12:30-32

Chandra A., Chandna P., Deswal S., Mishra R.K., Kumar R. (2015). Stature prediction model based on hand anthropometry. Int J Med Health Biomed Bioeng Pharma Eng 9(2):201-207.

Danborno B., Elukpo A. (2008). Sexual dimorphism in hand and foot length, indices, stature-ratio and relationship to height in Nigerians. Int J Forensic Sci 3(1):379-383.

Dey S., Kapoor A.K. (2015). Sex determinations for forensic identification. Int J Res Med Sci 3(6):1466-1472.

Dubois L., Kyrik O., Girard M., Tatone-Tokuda F., Perusse D. (2012). Genetic and environmental contribution to weight, height, and BMI from birth to 19yrs of ages. An international study over 12,000 twin pair,7(2):153.

Goswami R.B., Thakur P.S., Dadu S.K., Rastogi A. K. (2016). Estimation of stature from anthropometry of hand: an interesting autopsy based study in Madhya Pradesh, India. Int J Res Med Sci 4(6): 1873-1878.

Habib S.R., Kamal N.N. (2010). Stature estimation from hand and phalanges lengths of Egyptians. J Forensic Leg Med 17(3):156-160.

Ibeachu P.C., Abu E.C., Didia B.C. (2011). Anthropometric sexual dimorphism of hand length, breadth and hand indices of the university of Port-Harcourt students. Asian J Med Sci.; 3(8):146–50.

Jasuja O.P., Singh G. (2004). Estimation of stature from hand and phalange length. J Ind Acad Forensic Med 26(3):100-106.

Kanchan T., Rastogi P. (2009). Sex determination from hand dimensions of North and South Indians. J Forensic Sci 54(3):546–550.

Kumar T., Singh V. (2015). A preliminary report on hand preference with hand length, hand breadth and shape indices and its role in sexual dimorphism. Int J Recent Trends Sci Technol 14(2):308-315.

Mahrous A.I., Athar M.K., Abeer M.H., Naif I.A. (2016). Sex determination from hand dimensions and index/ring finger length ratio in North Saudi population: Medico-legal view. Egypt J forensic Sci 6:435-444.

Malina RM. (1994) Physical growth and biology maturation of young athletes. Exercise and Sports Sciences Review.; 22:389-433.

Numan A.I., Idris M. O., Zirahei, J. V., Amaza, D. S., Dalori, M. B. (2013). Prediction of stature from hand anthropometry: a comparative study in the three major ethnic groups in Nigeria. British Journal of medicine and medical research 3:1062-1073.

Oladipo G. S., Paul C. W., Bob-Manuel I. F., Fawehinmi H. B., Edibamode E. I. (2009). Study of digital and palmar dermatoglyphic patterns of Nigerian women with malignant mammary neoplasm. Journal of applied Biosci.15:829-834.

Oria R.S., Igiri A.O., Egwu O. A., Nandi M.E. (2016). Prediction of stature from hand length and breadth: anthropometric study on an adult Cross River state population. Annals of Biological anthropology 4:12-16.

Ozaslan A., Karadayi B., Kolusayin M.O., Kaya A. Afsin H. (2012). Predictive role of hand and foot dimension in stature estimation. Rom J Leg Med 20:41-46.

Pandey N. (2015). Estimation of stature from dimensions of hand in medical students. Int J Sci Stud 3(1):35-38.

Patel J.P., Patel B.G., Shah R.K., Bhojak R.N., Desai J.N. (2014). Estimation of stature from hand length in Gurat region. NHL J med Sci 3(1):41-44.

Tarsem K., Vishram S. (2015). A preliminary report on hand preference with hand length, hand breadth and shape indices and its role in sexual dimorphism. International Journal of Recent trends in Science and Technology 14(2):308-315.

Rastogi P, Nagesh KR, Yoganarasimha K. (2008). Estimation of stature from hand dimensions of North and South Indians. Legal Medicine.;10:185-189

Varu P.R., Gajera C.N., Mangal H.M., Modi P.M. (2016). Determination of sex using hand dimensions. International journal of medical toxicology and forensic medicine 6(1):23-28.

Vickas D., Manju, B., Shaveta G. (2016). Sexual dimorphism in hand dimensions: Anthropometric study in North Indian Haryanvi Adolescents. Int J Anat Res 4(1):2102-2107.