

Estimation of stature from right second digit, right fourth digit, and right foot length in Annangs of Akwa Ibom State of Nigeria

ABSTRACT

Introduction: Stature is one of the most important and useful anthropometric parameters that determines the physical identity of an individual. **Aim:** This study was carried out to estimate stature using second and fourth digit (2D and 4D) of the right hand and right foot length (RFL) of the Annangs in Akwa Ibom State of Nigeria. **Method:** Two hundred adult Annangs were used for the study. They comprised 100 each of males and females with the age of 18 years and above, exclusion of those with hand and foot deformities. A digital Vernier caliper was used to measure the length of the right 2D (R2D) and right R4D from the basal crease to the tip of the finger. A measuring tape which is calibrated in centimeter was used to measure the RFL. The height was also measured with a measuring tape for each subject. **Results:** There was a strong correlation between RFL, R2D, and R4D with stature. Regression equation showed that stature can be estimated accurately from the RFL, R2D, and R4D. **Conclusion:** This study has demonstrated a means of identification of individuals among the Annangs in Akwa Ibom State, Nigeria.

Key words: Digit, estimation, foot length, stature

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INTRODUCTION

Body stature (height) has been reported as one of the most important and useful anthropometric parameters, which determines the physical identity of an individual. It is considered to be an important assessment in the identification of unknown human remains. Because of this, the reliability of stature estimation from upper extremity measurements^[1,2] as well as lower extremity^[3-6] has been documented. The usefulness of this has been continually applied in forensic medicine, clinical practice, anthropology, and other medical sciences^[7,8] Anatomically, stature which is a composite of linear dimensions of skull, vertebral column, pelvis, and legs^[8] and some parts of the foot has been estimated in many populations using regression formulas derived from hand dimensions.^[9]

Anatomically, the second digit (2D) (index finger), also referred to as forefinger, is the 2D of a human hand. It

is located between the thumb and the middle finger. It is usually the most dexterous and sensitive finger of the hand,^[10,11] whereas fourth digit (4D) (ring finger) is the 4D of a human hand and the second most ulnar finger located between the middle finger and the little finger.^[10,11] It has been shown that men have relatively shorter index fingers than ring fingers.^[12-14]

Foot length is defined as the straight distance from the most prominent part of the heel backward (pternion) to the most distal part of the longest toe (acropodion). The length of the foot can tell a lot about a person's height.^[15] Earlier reports have shown that a relationship exists between stature, finger length, and foot length.^[16] In a study carried out in the coastal region of South India, it was shown that the predictive values are higher in the males than in the females

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and this is in agreement with findings of El-Meligy *et al.*^[17] reporting the same phenomena in establishing stature from tibial length and malleolar breadth in an Egyptian sample. El-Meligy *et al.*^[17] reported on the estimation of height from digit length and foot length in a North Indian population.

A study on the estimation of height from the lengths of 2D and 4D in Nigerians showed that the predictive values are higher in the males than in the females.^[2] Tyagi and Kohli^[18] studied on the subjects from Delhi and found positive correlation between stature and finger lengths and have suggested that index finger was best for the prediction of stature in both males and females.

Krishan *et al.*^[19] estimated stature from index and ring finger length in a North Indian population and observed that stature can be estimated from these finger lengths with a reasonable accuracy. It was Ozden *et al.*^[20] who reported that reliability of prediction of height from foot length was as high as that from long bones [Figure 1]. Similar views are expressed that either of the feet can be used for the estimation of stature as no significant asymmetry was observed by him while working on the footprints of a South Indian population.^[21]

Anatomically, the usefulness of anthropometric parameters that determine the physical identity of an individual is considered to be an important assessment in the identification of unknown human remains.

MATERIALS AND METHODS

The material used for this study included a digital Vernier caliper, tailor’s measuring tape, carpenters measuring tape, ruler, pen, and notebook. This was a prospective study of the estimation of stature from right 2D (R2D), right 4D (R4D), and right foot length (RFL) in Annang of Akwa Ibom State of Nigeria. The study area is Ika Local Government Area of Akwa Ibom State, where subjects were randomly picked. The total number of subjects used was 100 males and 100 females through convenient sample size. They were all adult Annangs between the ages of 18 and 65 years by both parents and genealogies. Subjects with deformities of vertebral column and limbs were excluded from the study.

Height was measured from the highest point on the head of the subject excluding the hair to the sole of the feet; subjects were asked to take off their shoes to avoid altering the value.^[22] R2D and R4D were measured from the bottom crease to the top of the finger, using the method of Manning, 2002.^[23] The measurement was taken using a digital Vernier caliper.

Foot length was measured from the most prominent part of the heel, backward (pternion) to the most distal part of the longest toe (acropodion) with the subject standing barefoot and the weight of the body equally distributed on both feet using Kanchan’s method. Measurement was taken using a tailor’s tape.

The data obtained were subjected to statistical analysis using descriptive statistics and inferential statistics of paired sample test, Pearson’s moment correlation coefficient, and regression analysis with the aid of Statistical Package for Social Sciences (SPSS) version 20.0 software.

RESULTS

The results of the mean, standard deviation (SD), and range (minimum and maximum values) of the various variables investigated are also presented in Tables 1-4. The mean values and SD for age (years), height (cm), RFL (cm), R2D (cm), and R4D (cm) for males are 26.03 ± 7.81 cm, 167.72 ± 6.04 cm, 25.83 ± 1.30 cm, 6.94 ± 0.57 cm, and 7.20 ± 0.57 cm, and that of females are 27.23 ± 10.82 cm, 159.04 ± 8.74 cm, 24.20 ± 1.44 cm, 6.39 ± 0.61 cm, and 6.74 ± 0.66 cm, respectively. The mean values of males are higher than that of females [Table 1].

The result of Table 2 was sexually dimorphic, i.e., males and females do not have same values. There was a significant difference in the mean values of all the parameters higher in males than in the females. Correlations were established between RFL and height, R2D and height, R4D versus height as shown in Table 3. This implies that there was a significant (strong) correlation between stature and the foot length (RFL), R2D, and R4D.

Regression analysis showed that stature can be estimated accurately from foot length and digit length.

Table 1: Descriptive statistics of the age (years), height (cm), right foot length (cm), right second digit length (cm), right fourth digit length (cm) of male and female Annangs of Akwa Ibom State, Nigeria

Parameters	Sample size		Minimum value		Maximum value		Mean ± SD	
	Male	Female	Male	Female	Male	Female	Male	Female
Age (years)	100	100	18.00	18.00	52.00	55.00	26.03 ± 7.81	27.23 ± 10.82
Height (cm)	100	100	153.00	143.60	178.00	178.00	167.72 ± 6.04	159.04 ± 8.74
RFL (cm)	100	100	22.90	20.30	28.70	28.70	25.83 ± 1.30	24.20 ± 1.44
R2D (cm)	100	100	5.68	4.81	8.68	8.68	6.94 ± 0.57	6.39 ± 0.61
R4D (cm)	100	100	5.98	5.14	8.94	8.94	7.20 ± 0.57	6.74 ± 0.66

RFL=Right foot length; R2D=Right second digit; R4D=Right fourth digit; SD=Standard deviation

Table 2: The results of paired samples analysis (t-test) between males and females of Akwa Ibom State, Nigeria, at 95% confidence interval or P=0.05

Variable or parameter	Degree of freedom	P	t	Inference
Age	99	0.374	0.893	Significant
Height	99	0.000	10.671	Significant
RFL	99	0.000	8.128	Significant
R2D	99	0.000	6.358	Significant
R4D	99	0.000	4.788	Significant

RFL=Right foot length; R2D=Right second digit; R4D=Right fourth digit

Table 3: The results of Pearson moment correlation between height and other investigated parameters (right foot length right second digit and right fourth digit)

Parameters	Sample size		Correlation coefficient (r)		Critical or P	
	Male	Female	Male	Female	Male	Female
RFL and height	100	100	0.456**	0.588**	0.000	0.000
R2D and height	100	100	0.319**	0.428**	0.001	0.000
R4D and height	100	100	0.231*	0.428**	0.021	0.000

*Correlation is significant at the 0.05 level (two-tailed); **Correlation is significant at the 0.01 level (two-tailed). RFL=Right foot length; R2D=Right second digit; R4D=Right fourth digit

Table 4: Regression equations for the estimation of stature of Annang people

Parameters	Regression equations for estimation of stature	
	Annang males	Annang females
RFL (cm)	Height=13.0+2.1	Height=92.6+2.7
R2D (cm)	Height=144.5+3.4	Height=129.1+4.7
R4D (cm)	Height=150.3+2.4	Height=129.6+4.4

RFL=Right foot length; R2D=Right second digit; R4D=Right fourth digit

DISCUSSION

The result of the anthropometric study among adult males and females of Annang in Akwa Ibom State, Nigeria, has revealed that foot length and digit length can be used in the estimation of stature. Based on this study, age grouping did not show any significant correlation with stature estimate. It was revealed that correlation existed between RFL and height, R2D and height and R4D versus height. They were significant at 0.01 levels. This suggests that relationship or association exists between stature or height and these three variables. It is on the basis of a measurable relationship that estimation of stature is made possible in anthropometry. Most authors formulated their predictive equations based on the existence of this association.^[2,8,19,24]



Figure 1: Picture of right fourth digit being measured

In the present study, the investigated predictive value of stature and other parameters are greater for males than females, which was statistically significant. This is in agreement with findings of El-Meligy *et al.*,^[17] reporting the same phenomena in establishing stature from tibial length from the basal crease of the digit to the tip of the 2D and 4D of the right hand in an Egyptian sample. Krishan and Sharma also reported the possibility of estimation of height from hand and foot length in a North Indian population. This implies that the ability to accurately predict height from R2D, R4D, and RFL is greater in the males than in the females. This study may be helpful in medicolegal issues in personality identification.

CONCLUSION

In conclusion body stature (height) is one of the most important and useful anthropometric parameters which determine the physical identity of an individual. It is considered to be an important assessment in the identification of unknown human remains. This has provided an insight as the result of the anthropometric study among adult males and females of Annang in Akwa Ibom state has revealed that foot length and digit length can be used in the estimation of stature.

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Conflicts of interest

There are no conflicts of interest.

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