

Index and ring finger lengths and their correlation with stature in a Nigerian population

ABSTRACT

Introduction: This study was carried out to determine the relationship of the index and ring fingers to stature for the purpose of predicting stature in a Nigerian population. **Materials and Methods:** Measurement of various parameters was done with the aid of a digital stadiometer and a digital Vernier caliper. The stadiometer was used to measure the heights of individuals, while the digital Vernier caliper was used to measure the lengths of the right index (R2D) and right ring (R4D) fingers. Statistical analysis, which included the *t*-test, Pearson correlation, and regression analysis, was carried out with the aid of SPSS version 19.0. **Results:** From the results, it can be seen that all parameters investigated were higher in males ($P < 0.05$) and that the correlations between R2D and stature and between R4D and stature were significant across gender. Our results also showed that it is possible to estimate the stature of an unknown Nigerian from the lengths of the second and fourth digits. **Conclusion:** Thus, this study has demonstrated a means of identification, especially in case of accident with lacerated remains in Nigeria. This paper is recommended to forensic experts, road safety officers, and the Government of Nigeria for the aforementioned purposes.

Key words: Correlation, digit, Nigeria, stature

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INTRODUCTION

Anatomically, the index finger is the second digit of the hand and the ring finger is the fourth digit. Researchers have long demonstrated gender differences in the fingers of humans. Generally, in females, the index and ring fingers have almost the same length, while in males the ring finger is longer than the index finger.^[1]

Human stature is a quantitative trait affected by genetics and environmental factors. Stature (height) estimation plays an important role in the identification of deceased persons from a few body parts, such as feet, hands, and arms, especially when stature cannot be measured directly due to body parts being dismembered.^[2]

A study carried out by Tyagi *et al.*^[3] on subjects from Delhi, India indicated that a positive correlation existed between stature and finger lengths, and it further suggested that the index finger was best for the prediction of stature in both males and females. In a similar study, it was observed that the correlation between stature and hand length was greater on the right side in both the sexes.^[4]

A study was carried out for the estimation of stature and foot dimensions in Hausa neonates. The authors reported a significant correlation between stature (height) and foot length, and showed that foot length could be a better parameter in estimating stature.^[5] Chandra^[6] studied the correlation between stature and length of fingers, demonstrating that height (stature) and the length of the hand correlated more in males than females and that both right and left fingers were symmetrical, with no bilateral variation.^[6]

Oladipo *et al.*^[7] carried out a study on the digit ratio in Nigerians, and the results of their study on Igbos and Urhobos showed the existence of sexual differences but no ethnic variation between the two ethnic groups investigated. In 2013, a study was designed with some anthropometric parameters with the Itsekiri and Okpe ethnic groups of Delta State, Southsouth Nigeria, and 250 males and 250

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females were randomly selected for this study. The results showed sexual dimorphism in the ethnic groups, with males showing higher values than females ($P < 0.05$).^[8] However, the study did not investigate the correlations among the parameters.

There is a paucity of information on estimation of the stature of Nigerians from their digits. In view of this, the present study was carried out to determine how the index and ring fingers correlated with stature in a Nigerian population. The disparity that existed between index and ring finger lengths in both adult males and females was also examined with regard to sexual dimorphism.

MATERIALS AND METHODS

The materials used for this study included a digital Vernier caliper, carpenter’s tape measure, ruler, pen, and a notebook. This was a prospective study of the index and ring fingers and their correlation with stature in a Nigerian population using Nigerian subjects residing in Rivers State, Nigeria. The study areas in Rivers State included the University of Port Harcourt, Alakahia, Aluu, and Idu Obosiukwu in Ogba land. Subjects were selected randomly from the communities mentioned above. This is the ideal thing in research of this nature. We rely solely on the information provided by the respondents. Their ages ranged from 18 to 77 years. Subjects with anomalies of the limbs and digits and those with a history of surgical intervention through plastic surgery involving the limbs were excluded. Out of the 500 subjects recruited for this study, 250 were males and 250 were females.

Height (stature) was determined using a digital stadiometer. Measurements were taken from the highest point of the head. The subjects were asked to remove their shoes to avoid inflation of values. Index and ring finger lengths were measured from the midpoint of the bottom crease



Figure 1: Picture showing measurement of the index and ring finger lengths with a Vernier caliper

where the finger joins the hand to the tip of the finger.^[9] The lengths of the fingers were measured using a digital Vernier caliper [Figure 1].

Statistics

Following the measurements, height (stature) and finger length [index (2D) and ring (4D)] data were subjected to statistical analysis using the software package SPSS (Statistical Package for Social Sciences, SPSS, Inc., an IBM Company Copyright 2010, Sun Microsystems Inc, USA) 19.0 for discrete statistics, *t*-test, correlation coefficient, and regression analysis to derive equations for estimation of height (stature).

RESULTS

The results of our study are presented in Tables 1-6. As shown in Table 1 (Male), the minimum age observed was 18.0 years, while the maximum age was 77.0 years, with a mean age of 26.08 ± 7.58 years; the right index (R2D) finger length in cm recorded was 5.20 cm minimum, while 9.62 cm

Table 1: Summary of the descriptive statistics of the age (years), second right digit (R2D) length (cm), the fourth right digit (R4D) length (cm), and stature (cm) of male Nigerians

Variable	Sample size	Min.	Max.	Mean ± Standard deviation
Age (years)	250	18.0	77.0	26.08±7.58
R2D (cm)	250	5.20	9.62	7.10±0.66
R4D (cm)	250	5.52	9.63	7.42±0.65
Stature (cm)	250	153.20	195.10	171.53±7.04

2D = Second digit; 4D = Fourth digit; R = Right

Table 2: Summary of the descriptive statistics of the age (years), second right digit (R2D) length (cm), fourth right digit (R4D) length (cm), and stature (cm) of female Nigerians

Variable	Sample size	Min.	Max.	Mean ± Standard deviation
Age (years)	250	18.0	63.0	24.48±6.65
R2D (cm)	250	5.43	8.68	6.70±0.45
R4D (cm)	250	5.11	8.94	6.99±0.47
Stature (cm)	250	150.00	176.60	161.81±5.54

2D = Second digit; 4D = Fourth digit; R = Right

Table 3: Results of analysis of Pearson correlation of R2D, R4D, and stature in male subjects

Variable	Sample size	Correlation coefficient (r)	Critical or P value
R2D versus stature	250	**0.513	0.000
R4D versus stature	250	**0.515	0.000

**Correlation is significant at the 0.01 level (two-tailed), 2D = Second digit; 4D = Fourth digit; R = Right

Table 4: Results of analysis of Pearson correlation of R2D, R4D, and stature in female subjects

Variable	Sample size	Correlation coefficient (r)	Critical or P value
R2D versus stature	250	**0.342	0.000
R4D versus stature	250	**0.334	0.000

**Correlation is significant at the 0.01 level (two-tailed); D = Second digit; 4D = Fourth digit; R = Right

Table 5: Results of paired sample test between male and female Nigerians

Variable	P value	Degree of freedom	T value	Inference
R2D	0.000	249	7.852	Significant (2-tailed)
R4D	0.000	249	8.347	Significant (2-tailed)
Stature	0.000	249	17.030	Significant (2-tailed)

*Significant at $P < 0.05$ levels; 2D = Second digit; 4D = Fourth digit; R = Right

Table 6: The regression equations derived forestimation of stature from R2D and R4D in male and female Nigerians

Regression equations for estimation of stature		
Variables	Male Nigerians	Female Nigerians
R2D (cm)	Height (cm)=132±5.50 R2D	Height (cm)=134±4.21 R2D
R4D (cm)	Height (cm)=130±5.55 R4D	Height (cm)=134±3.98 R4D

2D = Second digit; 4D = Fourth digit; R = Right

was the maximum length, with a mean digit length of 7.10 ± 0.66 cm; the right ring (R4D) finger length in cm was recorded as 5.52 cm minimum and 9.63 cm maximum, with a mean digit length of 7.42 ± 0.65 cm; the minimum stature recorded was 153.20 cm, and 195.10 cm the maximum, with a mean stature of 171.53 ± 7.04 cm.

As shown in Table 2 (Female), the minimum age observed was 18.0 years, while the maximum age was 63.0 years, with a mean age of 24.48 ± 6.65 years; the R2D length in cm recorded was 5.43 cm, while the maximum was 8.68 cm, with a mean digit length of 6.99 ± 0.47 cm; R4D length in cm recorded was 5.11 cm minimum and 8.94 cm maximum, with a mean digit length of 6.99 ± 0.47 cm. Stature (cm) recorded was 150.0 cm minimum and 176.60 cm maximum, with a mean stature of 161.81 ± 5.54 cm. The results in Tables 1 and 2 indicated that stature (in cm) and finger lengths (R2D and R4D, in cm) were generally higher in males than in females.

The results of the Pearson correlation of R2D, R4D, and stature in male subjects [Table 3] recorded strong positive correlations. Correlations in female subjects, however, [Table 4] were weak, though significant ($P < 0.0$). In Table 5, significant sexual differences were observed in

all parameters ($P < 0.05$). Two regression equations were derived per gender [Table 6]. They may be used to estimate the stature of Nigerians.

DISCUSSION

This study on index and ring finger lengths and their correlation with stature revealed that there was a statistically significant positive correlation between finger length (index and ring fingers) and stature, which was useful in predicting the height (stature) of an individual. An earlier study had suggested that the index finger in comparison with the ring finger was best for the prediction of stature in both males and females among South Indians.^[3] Our study seems to be more reliable than that of Tyagi *et al.*^[3] in predicting the stature Nigerians as both fingers are useful. Besides, our finding agreed with the observation by Manning *et al.*,^[10] who showed that differences existed in the morphology of index and ring fingers across gender. Furthermore, this study on estimation of stature from digits lengths is another reliable method similar to the method of Egwu *et al.*^[11] on estimation of stature of Nigerians using foot dimensions.

The correlation was higher in males than in females in the present study but was significant in both, which is similar to the results obtained by Saxena^[4] with a Nigerian population, suggesting that stature could be predicted with good accuracy using hand lengths in both sexes. Furthermore, equations were derived from the present study that may be used in the estimation of stature among Nigerians. These equations, as expected, are race-specific and could provide clues in forensic cases.

This study is of high importance, considering the differences in the lengths of digits and stature that exist across ethnic groups, races, and genders.^[6] We have, therefore, carefully derived separate equations for different genders and digits in this study, which corroborates the general view.

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