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RESEARCH ARTICLE

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Anthropometric Distance between the Proximal and Distal Interphalangeal Joints of the Ring Finger in Relation to Height among the Ukwuani and Ika Ethnic Groups in Delta State, Nigeria

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ABSTRACT

Background: This study investigated the anthropometric distance between the proximal and distal interphalangeal joints of the ring finger in relation to height among the Ukwuani and Ika ethnic groups in Delta State, Nigeria.

Methods: Three hundred and eighty four subjects were used for this study, that is: one hundred and nine-two from Ukwuani ethnic group and the other one hundred and nine-two from Ika ethnic group. The study targeted subjects between the ages of 17 to 30 years. Data was analyzed via the Statistical Package for Social Sciences.

Results: Our study revealed that the mean value for height recorded for the Ika subjects (males=173.25±5.62cm and females= 165.98±5.93cm) are higher than that recorded for their Ukwuani counterpart (males=171.37±8.40 and females=161.77±6.03). The difference observed in the means were extremely significant (p<.001). In addition, it was shown that the Ukuwani subjects are significantly shorter and have shorter length between proximal and distal interphalangeal joints in the ring finger than the Ika people, the males are taller and have longer length between proximal and distal interphangeal joints in the ring finger than the females in Ika and Ukwuani tribes.

Conclusion: The distances between the proximal and distal interphalangeal joints of the ring fingers were in positive as well as considerable correlation with the stature in the ethnic groups studied.

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Introduction

Forensic anthropology is a branch of physical anthropology which interacts with other disciplines pertaining to the understanding of crime and its investigations [1]. The biological profile of a person such as age, sex, ethnicity and stature can be determined with the help of anthropometry [2,3]. Among these 'big fours' of anthropology, estimation of stature is considered as an important anthropometric parameter to the anthropologist, anatomist, obstetrician and in medico-legal practice. Many human features have been used to estimate stature from skeletal remains and body parts owing to the established relationship between stature and different parts of the body [3].

Individual finger movements are not independent of other fingers due to: mechanical links provided by connective tissue, multi-finger motor units in the extrinsic finger muscles, and overlapping cortical representations of the finger muscles [4]. The result of these constraints is a behavior referred to as enslaving: when a single finger intentionally moves or produces force, other fingers also unintentionally move or produce force. It is generally accepted that enslaving is due to a combination of the three previously mentioned constraints on individuated finger movements; however, the relative contribution of each is unknown. It is unknown whether the activation of the finger flexors of one finger and/or change of the finger position will change the moment arms of the flexors of other fingers [5].

According to the literatures, it is known that the human fingers utilize the appropriate joint coordination between the PIP (proximal interphalangeal) joint and the DIP (distal interphalangeal) joint. Such joint motion behavior of human fingers is important for effective human-like motions [6,7].

This study investigated the anthropometric distance between the proximal and distal interphalangeal joints (middle phalangeal length) of the ring finger in relation to height among the Ukwuani and Ika ethnic groups in Delta State, Nigeria.

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Methods

Three hundred and eighty four subjects (Male=192 and female=192) were used for this study, that is one hundred and nine-two from Ukwuani ethnic faction and the other one hundred and nine-two from Ika tribal bloc. The subjects (male and female) were between the ages of 17 to 30 years. The Ukuwani ethnic group population in Delta State from census figure is 103,000 while the Ika ethnic group population is 240,000.

Method of Data Collection

All data were collected from subjects in Obiaruku and Agbor. In collection of data, the digital sliding vernier caliper was used and the following were measured

Height: It was measured as the vertical distance from the vertex to the floor, where the vertex is the highest point on the head when the head is held in Frankfurt Horizontal (FH) plane. The subject was made to stand barefoot in an erect posture against the wall with both feet kept close together and hands hanging down on the sides.

Middle Phalangeal Length: was measured as the distance between the proximal and distal interphalangeal joints.

For measurements on hand, all the digits including the thumb were kept fully extended.

Ethical Consideration

Ethical approval was obtained from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, Delta State University, Abraka in Nigeria.

Data Analysis

The results were expressed as Mean SEM (standard error of the mean) and data analysis was done using the Statistical Package for Social Sciences to calculate the mean, standard error of mean and correlation. The significance of the results between the two ethnic groups was tested using student's t-test (independent). 'P'-value of less than 0.001 was considered significant.

Results

Table 1: Showing Mean, Minimum and Maximum Values and Standard Deviation for Age in the Ukwuani and Ika Groups

	N	Minimum (years)	Maximum (years)	Mean (years)	Standard Deviation (±)
Ukwuani (age)	192	17.00	30.00	22.11	3.20
Ika (age)	192	17.00	29.00	22.47	2.65

The Ukwuani subjects had a mean age value of 22.11±3.20years with a minimum and a maximum value of 17 and 30years respectively while the Ika subjects had a mean age value of 22.47±2.65years with a minimum and maximum value of 17 and 29years respectively. This implies that there is a difference in the age between the two studied groups (Table 1).

Table 2: Showing Frequencies and Percentages for Gender in Both Studied Groups

	Gender	Frequency (n)	Percentage (%)
Ukwuani group	Male	94	49.0%
	Female	98	51.0%
Ika group	Male	98	51.0%
	Female	94	49.0%

For gender population of the studied groups, lesser number of male subjects in the Ukwuani group participated in the study as compared to their female counterpart and vice versa for the Ika group as clearly presented in Table 2.

Table 3: Descriptive Statistics Showing the Mean Height (In Cm) of Both Sample Groups

		N	Mean
Height of Ukwuani subjects (cm)		192	166.44±8.70
	Male	94	171.31±8.40
	Female	98	161.77±6.03
Height of Ika subjects (cm)		192	169.69±6.82
	Male	98	173.25±5.62
	Female	94	165.97±5.93

The results in Table 3 showed that the mean value for height recorded for the Ika subjects (males=173.25±5.62cm and females= 165.98±5.93cm) are higher than that recorded for their Ukwuani counterpart (males=171.37±8.40 and females=161.77±6.03). This implies that there is gender difference between the two studied groups. In addition, the difference observed in the means were extremely significant (p<.001).

Table 4: Descriptive Statistics Showing the Mean Length of the Distance between the Proximal and Distal Interphalangeal Joints (Middle Phalangeal Length) of Both Sample Groups

		N	Mean
Distance between the proximal and distal interphalangeal joints of Ukwuani group (mm)		192	29.71±5.43
	Male	94	31.32±4.98
	Female	98	28.16±5.41
Distance between the proximal and distal interphalangeal joints of Ika group (mm)		192	33.12±5.54
	Male	98	35.39±6.11
	Female	94	30.74±3.59

Similarly as recorded in Table 3, the results in Table 4 showed that the mean value for the distance between the proximal and distal interphalangeal joints of the ring finger recorded for the Ika subjects (males=35.39±6.11 and females= 30.74±3.59) are higher than that recorded for their Ukwuani counterpart (males=31.32±4.98 and females=28.16±5.41). This implies that there is gender difference between the two studied groups. In addition, the difference observed in the means values of the distance between the proximal and distal interphalangeal joints of the ring finger in the two groups were exceptionally significant at level of p< .001.

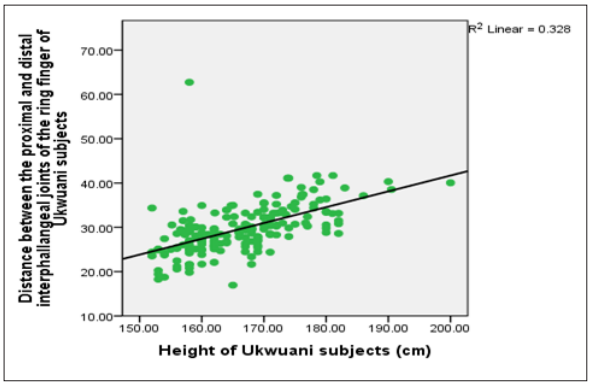

Figure 1: Scatter-Plot Illustrating Correlation between the Distance between the Proximal and Distal Interphalangeal Joints of the Ring Finger and Height in the Ukwuani Group

Figure 1 divulged a positive correlation between the distance between the proximal and distal interphalangeal joints of the ring finger and height (r=0.572), in the Ukwuani group. This relationship is immensely significant at p<.001.

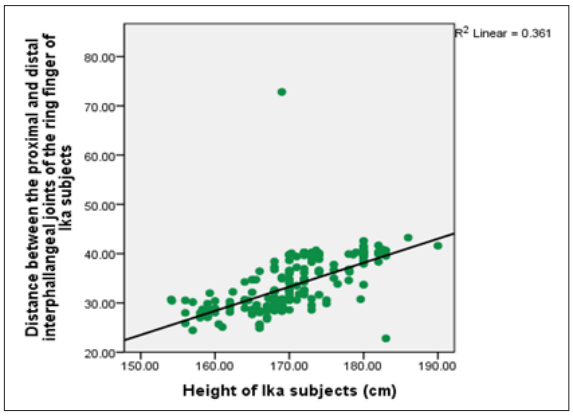

Figure 2: Scatter-Plot Illustrating Correlation between the Distance between the Proximal and Distal Interphalangeal Joints of the Ring Finger and Height in the Ika Group

Figure 2 disclosed a strongly positive correlation between the distance of the proximal and distal interphalangeal joints of the ring finger and height (r=0.600) in the Ika group. This correlation is wholly significant at p<.001.

Discussion

Anthropometric techniques are commonly used by anthropologists and adopted by medical scientists to estimate the stature of an individual. Studies have shown that hand dimensions vary in different races therefore formulae derived for one ethnic group may not be applicable to another ethnic group and this may be attributed to biological and environmental factors [8,9]. As the two ethnic groups are from Nigeria even though from different geographical locations and climatic conditions, some similarity and dissimilarity may be expected among the ethnic groups. A study has shown that no two individuals are exactly alike genetically; even identical twins differ in some aspects, and the variability is strongly influenced by genetic and environmental factors [10].

The present study showed that the Ika subjects (males and females) are taller than and have longer distance between proximal and distal interphalangeal joints of the ring finger than their Ukwuani counterparts (males and females). It also observed that the male subjects in both ethnic sets are taller than and have longer distance between proximal and distal interphalangeal joints of the ring finger than their female counterpart. This may be due to the fact that body physique is influenced by sexual characteristics and hormonal factors. Duyar reported that the ratios of various body parts to height (stature) differed from one population to another and that ethnic difference and environmental factors can influence body population [11].

In the two ethnic groups, the male subjects showed higher values in height which is consistent with the findings of Numan and Krishan [12,13]. The males had longer distances between proximal and distal interphalangeal joints of the ring fingers. The males are significantly taller than the females in all the ethnic groups. This may possibly be because males have additional time for growth since the age of puberty is 2 years late in males as compared to females.

From the comparison of the height and distance between proximal and distal interphalangeal joints of the ring finger among the sexes of the two ethnic groups, it is evident that the Ika males are taller and have longer distance between proximal and distal interphalangeal joints of the ring finger when compared to the Ukwuani males. The difference in height is significant and there is strong correlation coefficient between the two parameters considered. Similarly, on comparison of height and distance between proximal and distal interphalangeal joints of the ring finger, the Ika females are taller and have longer distance between proximal and distal interphalngeal joints of the ring finger when compared to the Ukwuani females. This study is in accordance with the work of Numan who observed that females in two ethnic groups in Nigeria have different height and hand dimensions [12]. These population variations may be attributed to genetic and environmental factors.

The conclusion is that the distances between the proximal and distal interphalangeal joints of the ring fingers were in positive as well as considerable correlation with the stature in the ethnic groups studied. This is of essence when establishing stature from phalange length of the ring finger.

Conflicts of Interest: Nil

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