Estimation of Height Using Arm Span of The Itsekiris in Delta State of Nigeria.

*A. K. Iteire, 2E. Anibor and 2M. E. Akpo
1Department of Anatomy, University of Medical Sciences, Ondo State
2Department of Anatomy & Cell Biology, Faculty of Basic Medical Science, Delta State University, Abraka, Delta State.
[*Corresponding author: Email: kingsleyafoko@yahoo.co.uk]

ABSTRACT: Arm span (AS) has been reported to be a good substitute for height measurement in osteoskeptally deformed patients and in the elderly with osteoporosis. The aim of this study was to evaluate the relationship between arm span and height of the Itsekiris of Nigeria. The study employed a cross-sectional study design involving 300 healthy Itsekiris between the age of 20 and 70 years. The height and arm span of all volunteers were measured to the nearest centimeter. Height was measured with the subject on bare feet, feet together and with the calf, heel, buttocks and upper back touching the wall or stadiometer. The subject’s head was positioned erect with the eyes looking forward. Arm span accordingly was measured with a tape from the tip of the middle finger of one hand to the tip of the middle finger of the other hand, with the subject standing straight and back to the wall, both arms adducted to 90°. In this index, there was a weak positive correlation (0.048) which was not significant (p ≥ 0.05) between the male height and arm span, which suggested that arm span is not a good estimator of height for the male population. In the female population, there was a strong positive relationship (0.797) which was significant (p ≤ 0.001) between female height and arm span. This suggests that arm span was a good estimator of height for the females only in the population considered. Since arm span was a good predictor of height in only the female population, it is important for separate height models to be developed for each population on the account of ethnic, racial and gender differences.

Keywords: Arm span, Height, Itsekiris’, Relationship, Estimation

INTRODUCTION
Anthropology studies the origin, physical and cultural development, biological characteristics, social customs and beliefs of humankind. It is made up of sub-branches of which one is physical anthropology that describes humans in their biological, evolutionary and demographic dimensions (Haviland et al., 2010). Height is an important factor to narrow down the missing person’s identity. Some studies have previously reported the usefulness of several parameters in calculating height (Jalzem and Gledhill, 1993; Yun et al., 1995; Mitchell and Lipschitz, 1982). Arm span which is the length from the tip of the middle fingers to the left and right hands when raised parallel to the ground at shoulder height at 180° angle has been reported to be used in estimating height. However, the association of arm span and height was observed to differ racially (Reeves et al., 1996; Steele and Chenier, 1990). According to Gauld et al. (2004), height has been fundamental to assessing growth, nourishment, calculating body surface area, and predicting pulmonary functions in childhood. The establishment of alternative approaches for personal height estimation is important for a number of reasons (Ilayperuma et al., 2010). Primarily, in cases where height estimates need to be made from fragments of bones in archeological procedures or in forensic examinations after mass disasters or genocide (Ebit et al., 2008). Again, approximations of Pharmacokinetic parameters and assessment of nutritional status depend on precise measurements of not only weight, but also height (Ilayperuma et al., 2010). This has led several studies to recommend Arm span as a decent alternate measurement of height, both for its invariable nature with age and convenience in recording for hospitalized elderly patients and physical disabilities such as kyphosis (Hickson and Frost, 2003; Luft et al., 2008; Datta, 2011). Therefore this study was aimed at determining the relationship between arm span and height in the Itsekiri population of Nigeria.

MATERIALS AND METHOD
Study Population
The study population was composed of about 270000 Itsekiris habiting in Warri, Delta state. The Itsekiris are an ethnic group of Nigeria’s Delta State. They are mainly in Warri South, Warri North and Warri South West local government districts of Delta State, Nigeria.
Sample size
Three hundred (300) healthy adults between the ages of 20 to 70 years were randomly drawn from the population and were used for the study.

Selection Criteria
i. Subjects aged between 20 to 70 years of age.
ii. Both male and female.
iii. Physically fit subjects with no deformities of the limbs affecting standing height or arm length.
iv. Parents and grand-parents should hail from the Itsekiri ethnic groups.

Materials
i. Standard 5m × 16Ft measuring tape
ii. Stadiometer.
iii. Scientific calculator.
iv. Data sheet containing sex, age, arm-span 1, arm-span 2, height 1, height 2 average arm-span and average height.

Methodology (as modified from Canda, 2009)
The body height and arm span were taken according to the protocol of the International Society for the Advancement of Kinanthropometry (ISAK). The height and arm span of all participants were measured to the nearest centimeter (cm). Height was measured with the subject on bare feet, feet together and to the wall or stadiometer, with the calf, heel, buttocks and upper back touching the wall or stadiometer. The subject’s head was positioned erect with the eyes looking forward. Arm span was measured with a tape from the tip of the middle finger of one hand to the tip of the middle finger of the other hand, with the subject standing straight, with his/her back to the wall, both arms adducted to 90°, the elbows and wrists extended and the palms directly forward.

Statistical Analysis
The data generated were presented as means and standard deviations. Statistical significances were calculated using student t-test at 95% confidence limit (p ≤ 0.05). Pearson moment correlation was calculated to determine any existing relationship between the considered variables. All statistics were done with the aid of Statistical Package for Social Sciences (SPSS version 21).

RESULTS
Table 1 shows a very weak positive correlation between AS and height in the male population considered. This relationship was not significant (p ≥ 0.05) suggesting that AS was a weak estimator of height. On the contrary, AS of females was strongly positively correlated with their height and was significant (p ≤ 0.05). This suggests that AS was a reliable predictor of height in the female population considered.

Table 2 showed that males were significantly (p ≤ 0.05) taller than their female counterparts in the population considered. Also, AS of males was significantly (p ≤ 0.05) longer than that of females.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean ± SD</th>
<th>Pearson coefficient</th>
<th>p-val</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Height</td>
<td>184.02 ± 10.48</td>
<td>0.048</td>
<td>0.563*</td>
</tr>
<tr>
<td>Male AS</td>
<td>186.87 ± 6.1</td>
<td>0.797</td>
<td>0.001**</td>
</tr>
<tr>
<td>Female Height</td>
<td>160.51 ± 53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female AS</td>
<td>171.61 ± 57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: SD = Standard deviation; AS = Arm span; * = ≥ 0.05; ** = ≤ 0.05

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean ± SD</th>
<th>T</th>
<th>df</th>
<th>p-val</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male height</td>
<td>184.02 ± 128.35</td>
<td>2.256</td>
<td>149</td>
<td>0.026**</td>
</tr>
<tr>
<td>Female height</td>
<td>160.51 ± 6.55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male AS</td>
<td>186.87 ± 7.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female AS</td>
<td>171.61 ± 6.93</td>
<td>19.160</td>
<td>149</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

Key: SD = Standard deviation; AS = Arm span; * = ≥ 0.05; ** = ≤ 0.05
DISCUSSION
The findings of the present study on the male population are similar to the work of Goon et al. (2011), which reported that arm span was significantly different from height in the Asian males. This suggested that arm span measurement may be an inappropriate substitution for height in certain male populations and contradicts results of other studies (Marfell-Jones et al., 2006; Reeves et al., 1996; Steele and Chenier, 1990) that reported that arm span was a good predictor of height in males since the study revealed a very weak relationship between arm span and height in the male population considered. Therefore we can affirm that arm span may not be a good predictor of height among the male population of the Itsekiris.

In the female population, there was a strong correlation between height and arm span, consistent with the reports of (Steele and Chenier, 1990; Steele and Mattox, 1987). Therefore, arm span was a good predictor of height in the female population of the contemporary study, which was also consistent with the female population of other studies (Ofluoglu et al., 2008; Marfell-Jones et al., 2006; Zverev and Chisi, 2005; Manonai et al., 2001; Allen, 1989).

CONCLUSION
The findings of this study indicated that arm span is a good predictor of height in the female population only and not in the male population of the Itsekiris'.

RECOMMENDATION
Based on the above conclusion, it is necessary to develop a separate height model for each population on the account of ethnic differences. Although, arm span is still useful in the prediction of height among wheelchair athletes or other sport individuals with disabilities involving amputation of the leg or other deformities affecting standing height. Therefore, more studies on the discussed topic should be carried out on Nigerian population to show variety of findings.

REFERENCES
Ofluoglu D., Unlu F. and Akyuz G. (2008). Relationship between arm span and height in postmenopausal