

ASSESSING THE MEASUREMENT OF TORSO IN RELATION TO HEIGHT

Boamah, G. Y. and Abaidoo, C. S., Darko, N. D., Appiah, A. K., Tetteh, J., Diby, T., Okwan, D., Adjei-Antwi, C., Nketiah, J., Robertson, J. and Bempah, S.

Anatomy of Department, School of Medicine and Dentistry, KNUST, Kumasi

INTRODUCTION

Anthropometry involves the physical measurement of size, weight and proportions of the human body for the purposes of understanding human physical variation (Utkualp and Ercan, 2015). Studies and assessment of the human skeleton can help to ascertain the sex, age, ethnicity and height of an individual (Kanchan *et al.*, 2010). There is a significant relationship between body parts and the body as a whole irrespective of the established variations amongst population (Agnihotri *et al.*, 2008). By far, a lot of work has been done on anatomical prediction of height using anthropometric approach.

Torso is one of the body parts that might have a very significant relationship with the body height. Torso length may be an alternative marker for the estimation of height and subsequent identification of the involved individuals. The aim of this study was to generate baseline data on torso length and its relationship with height.

Specific objectives were;

- To determine the relationship between torso length and height.
- To derive regression models for height estimation using torso length.

MATERIALS AND METHODS

The study was conducted at the Anatomy Department, School of Medicine and Dentistry, Kwame Nkrumah University of Science and Technology (KNUST) from January to March, 2019. A total of 273 participants (60.4% males and 39.6% females) between the ages of 16 to 33 years were recruited for this study. Informed participants' consent and ethical approval were sought from the Committee on Human Research, Publications and Ethics at KNUST prior to the study. The heights of the participants were measured with a Shahe's Stature Meter (Shanghai, China) and their torso lengths were also measured from the tip of neural spine of the vertebra prominens to the midpoint of the supra-crystal plane using a fibre glass tape measure (Shanghai, China) (Figure 1). Individuals with vertebral column deformities such as kyphosis and scoliosis as well as individuals who could not stand upright for their direct height to be taken were excluded from the study. To reduce intra-observer error, measurements were taken twice by the same person in centimetres, and the average was used for the analysis.



Figure 1: A photograph showing the measurement of Torso length (x0.2)

DATA ANALYSIS

The data obtained were tabulated and coded on Microsoft Excel Spreadsheet version 2013. The coded data were then analysed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive analysis was done, and t-test was used for the evaluation of differences between groups. Correlation and simple linear regression analyses were performed to determine the relationship between height and torso length. A p value less than 0.05 was considered as the significant interval.

RESULTS AND DISCUSSION

SAMPLE CHARACTERISTICS

The mean age of participants was 19.81 ± 1.90 years. Males (19.81 ± 1.90 years) were significantly ($p < 0.0001$) older than females (18.99 ± 1.38 years). The mean standing height recorded for the general population was 168.11 ± 8.25 cm. Males had a mean standing height of 171.80 ± 6.79 cm and this was significantly different from that of females (162.46 ± 7.01 cm) (Table 1). The findings of this study were consistent with several studies (Agnohotri *et al.*, 2008; Fatmah, 2010; Bhavana, 2011). They attributed the difference to the varying effects of sex hormones on the skeletal system in both males and females (Table 1).

The mean torso length recorded for the study population was 45.16 ± 2.88 cm. Although, males (45.42 ± 3.01 cm) had numerically longer torso length than their female counterparts (44.76 ± 2.63 cm) in the present study, the difference was not statistically significant ($p = 0.064$). Therefore, torso length may not be a useful index for sexing an individual.

Table 1: Descriptive statistics and comparison of Torso length and Height of the study participants

| Parameter | | Mean \pm SD | Min | Max | p-value |
|-------------------|------------------|-------------------|-------|-------|---------|
| Height (cm) | All participants | 168.11 \pm 8.25 | 146.0 | 193.0 | < 0.001 |
| | Males | 171.80 \pm 6.79 | 160.0 | 193.0 | |
| | Females | 162.46 \pm 7.81 | 146.0 | 181.0 | |
| Torso length (cm) | All participants | 45.16 \pm 2.85 | 37.2 | 55.1 | 0.064 |
| | Males | 45.42 \pm 3.01 | 37.5 | 53.1 | |
| | Females | 44.76 \pm 2.63 | 37.2 | 55.1 | |

cm = centimeter; SD= Standard deviation; p-value= statistically significant (< 0.05); Min = Minimum value; Max= Maximum value

CORRELATION BETWEEN HEIGHT AND TORSO LENGTH

Pearson's correlation was performed to establish the relationship between height and torso length. Figures 2 — 4 show scatter plots and regression equations together with their correlation coefficients, between height and torso length for the pooled sample, males and females' participants. Correlation was significant for the pooled sample and in males, but not in the female participants. Torso length explained just 4.7% and 4.8% of the variation in height in the equations for the pooled sample and males respectively.

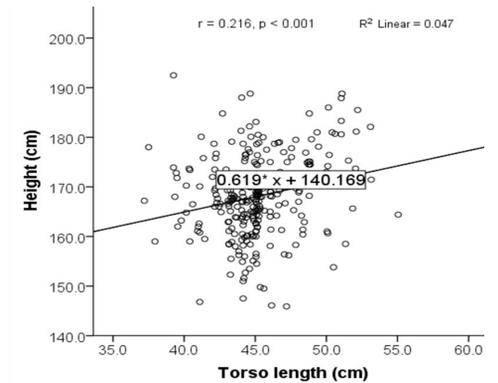


Figure 2: A scatter plot showing height estimation of the general population using torso length

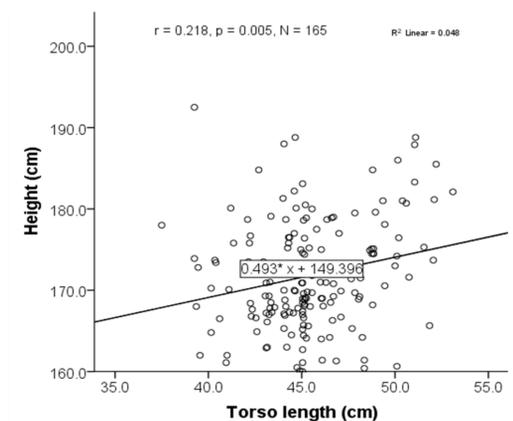


Figure 3: A scatter plot showing height estimation of the male participants using torso length

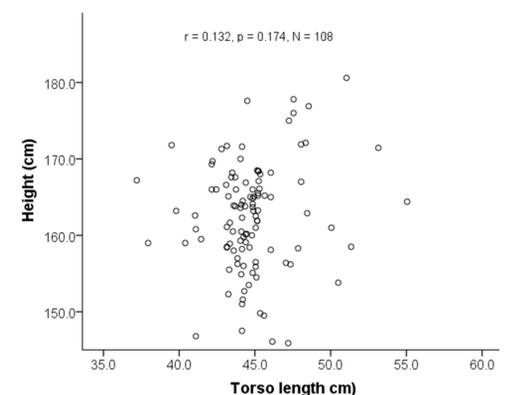


Figure 4: A scatter plot showing the relationship between height and torso length of the female participants

CONCLUSION

The relationship between torso length and height was very weak. Therefore, torso length may be unreliable in the estimation of height.

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