

## A Study of Anthropometric Correlation between Upper and Lower Limb Dimensions in Sudanese Population

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**Abstract :** Skeletal phenotype is a product of a balanced interaction between genetics and environmental factors throughout different life stages. Therefore, interlimb proportions are variable between populations. Although interlimb proportion indices have been used in anthropology in assessing the influence of various environmental factors on limbs, an extensive literature review revealed that there is a paucity of published research assessing interlimb part correlations and possibility of reconstruction. Hence, this study aims to assess the relationships between upper and lower limb parts and develop regression formulae to reconstruct the parts from one another. The left upper arm length, ulnar length, wrist breadth, hand length, hand breadth, tibial length, bimalleolar breadth, foot length, and foot breadth of 376 right-handed subjects, comprising 187 males and 189 females (aged 25-35 years), were measured. Initially, the data were analyzed using basic univariate analysis and independent t-tests; then sex-specific simple and multiple linear regression models were used to estimate upper limb parts from lower limb parts and vice-versa. The results of this study indicated significant sexual dimorphism for all variables. The results indicated a significant correlation between the upper and lower limbs parts ( $p < 0.01$ ). Linear and multiple (stepwise) regression equations were developed to reconstruct the limb parts in the presence of a single or multiple dimension(s) from the other limb. Multiple stepwise regression equations generated better reconstructions than simple equations. These results are significant in forensics as it can aid in identification of multiple isolated limb parts particularly during mass disasters and criminal dismemberment. Although a DNA analysis is the most reliable tool for identification, its usage has multiple limitations in undeveloped countries, e.g., cost, facility availability, and trained personnel. Furthermore, it has important implication in plastic and orthopedic reconstructive surgeries. This study is the only reported study assessing the correlation and prediction capabilities between many of the upper and lower dimensions. The present study demonstrates a significant correlation between the interlimb parts in both sexes, which indicates a possibility to reconstruction using regression equations.

**Keywords :** anthropometry, correlation, limb, Sudanese

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