D30 Analysis of Footprints and its Parts for Stature Estimation in Indian Population

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After attending this presentation, the attendees will be able to recognize that stature can be estimated from footprints and its parts with a reasonable accuracy in Indian population.

This presentation will impact the forensic science community by recognizing that stature can be estimated from footprints with a reasonable accuracy in males and females. The findings may prove to be useful in identification of unknown prints. It can give vital evidence in identification of the perpetrator of the crime in cases where the footprints are left behind at a crime scene.

Footprints are often encountered at crime scenes especially in cases of murders and sexual assaults. Estimation of stature from the footprints found at the crime scene can be crucial in the identification of the perpetrator in forensic examinations. A positive correlation exists between stature and foot size and hence, analysis of footprints can be useful in estimation of stature. Although a few researchers have attempted to estimate stature from footprints, the recent studies on the subject are confined to males only. The present research is aimed to estimate stature based on detailed analysis of length measurements of footprints in Indian population using statistical considerations.

The present research was conducted on 100 young adults (50 males and 50 females) at the Department of Forensic Medicine, Kasturba Medical College, Mangalore, India. Healthy individuals aged between 20 – 25 years were included in this study after giving informed consent. The subjects with any disease/deformity of the foot/spine were excluded from the study. The stature of each subject was measured in centimeters using standard techniques. Each subject included in the study was asked to wash their feet with soap and water. A clean plain glass plate was uniformly smeared with black duplicating ink with the help of a roller. The subjects were asked to step onto the smeared plate and then transfer them onto a white paper. Regular pressure was applied on the foot area to obtain the footprints. Five measurements were taken in centimeters on right and left footprints obtained from each subject. The measurements were taken from the mid-rear heel point to the most anterior point of each toe on right and left sides and designated as T1, T2, T3, T4, and T5 for the measurements of heel to toe 1, 2, 3, 4, and 5 respectively. Male-female differences in stature and foot measurements were analyzed using Student's t-test. Asymmetry between sides in the foot measurements was calculated and tested using paired t-test. Pearson's correlation coefficients were calculated between stature and various measurements of the foot. The stature was estimated from foot and its various measurements by using linear and multiple regression analysis. Statistical significance was defined at the standard 0.05 level.

Mean stature was significantly higher in males than females. Statistically significant sex differences were observed in the various measurements on the footprints between males and females in right and left feet. Right-left differences were observed in footprint measurements among males and females. Statistically significant correlation coefficients were observed for correlation between stature and various footprint measurements. Thus, the stature is found to be positively and strongly related to various foot measurements in males and females. In males, various foot measurements show relatively higher values of correlation coefficients than in females. The linear regression models were derived for stature estimation from each measurement as "S (stature) = a + b x" + SEE, where, "a" is constant and "b" is the regression coefficient of independent variable (i.e., individual foot measurement) and "x" is an individual variable/foot measurement. Multiple regression models were derived as S (stature) = a (constant) + b1 (1: regression coefficient of the variable) x X1 (1: variable) + b2 (2: regression coefficient of the variable) x X2 (2: variable) + . . . bn (n: regression coefficient of the variable) x Xn (n: variable) + SEE. Multiple regression models show a higher accuracy than linear regression models in stature estimation.

Forensic Science, Stature Estimation, Footprints

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