Gender determination from footprints among Ibans, an indigenous population in Malaysian Borneo Island in forensic perspective.

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Abstract

Person identification is the key factor in forensic investigation and hence forensic investigators are searching for physical evidence in crime scenes. Footprint forms a valuable physical evidence used for person identification. Footprints have been studied by both forensic and non-forensic personnel for various purposes. Footprint is one of the valuable physical evidence used to estimate stature and body weight under racial and ethnic consideration. Gender determination from footprint ridge density is an effective tool for inclusion or exclusion of perpetrators leading to person identification. Literature review shows that very limited research works have been conducted in gender determination through footprint. Hence the present investigation was aimed to determine gender from footprint ridge density among Iban ethnic, an indigenous population, mostly settled in Malaysian Borneo Island, west Malaysia. The result of the study provided useful information for gender determination from footprint in this population under study.

Keywords: Forensic Science: Footprint, Ridge density, Gender, Ibans, Malaysia.

Introduction

In any forensic practice, person identification is the first and foremost issue to solve the mystery and hence forensic investigators are searching for physical evidence in crime scenes. Foot impressions plays a vital role in human identification. Foot impression may be either in 2 dimensional or 3 dimensional in nature found in the crime scenes. A positive, or two-dimensional footprints are found on hard surfaces like tilled floor, cement, and similar surfaces left unintentionally by the perpetrator when the feet were stained with dust, mud or blood stains during the commission of crime. A negative or two dimensional footprints are found on dusty hard surfaces when the sole of the feet remove the dust from the surfaces. Both are two dimensional footprint and being used for the purpose of person identification. Footprints have been studied to estimate stature and body weight by considering the ethnicity. Identifying the gender of the offender from the crime scene is also an emerging issue in scientific investigation. Gender determination from footprint ridge density is an effective tool for inclusion or exclusion of perpetrators leading to human identification. Literature review shows that limited research works have been conducted in gender determination through footprint. Hence the present investigation aimed to determine gender from footprint ridge density among Iban ethnic, an indigenous population mostly settled in Malaysian Borneo Island.

Methods

The study sample comprised of 100 males and 100 females of adult Ibans in Malaysian Borneo Island, ages ranged from 18 to 60 years. Foot prints and stature have been collected from the consented subjects following the standard procedure. The study was based on data from eight nominated areas in each footprint (left and right) included five toes, two in ball area and one in heel area. Each area with defined size of 25mm² was analysed for ridge density counting in this study. So far, no study was conducted by analyzing eight areas in a footprint. Male-female differences in footprint density were statistically analyzed for each designated area and compared with other area within the footprint and then with other side. Bar graphs were drawn for all the designated areas in the footprint of Iban on both sides showing the gender dimorphism. The overall performance of the variables in gender estimation was analysed using Receiver Operating Characteristic curve.

Results

Footprint ridge density as a morphological feature of the human body has direct relevance not only to human morphological studies but also contributes to forensic anthropological knowledge through variability of ridge density in different regions of the sole of the foot. The prints left behind at a crime scene can give vital evidence regarding the perpetrator of the crime. The result of the footprint ridge density of this study shows that the mean footprint ridge density was significantly higher in females than males, in all eight designated areas in both left and right footprints (p<0.05). No right-left differences (bilateral asymmetry) were apparent in the analyzed area. Observations of the ROC analysis to find the predictability of each variable in gender determination in also shown in figures. Variations in footprint density between different areas in right and left feet were evident among males and females. Based on ROC analysis, it is observed that the sexing potential was maximal for footprint ridge density in fourth toe and least in heel area in females.

Fig 1. Eight designated areas on a right footprint for ridge density analysis among Malaysian Iban population.

Fig 2. Illustrative example of bar graphs showing the gender variation in great toes on both sides.

Conclusions

Gender determination from footprint ridge density becomes a scientific requirement in the crime investigation as well as to fulfil the legal requirement. Footprint ridge density as a morphological feature of the human body has direct relevance not only to human morphological studies but also contributes to forensic anthropological knowledge through variability of ridge density in different regions of the sole of the feet. Thus the present study proved the existence of gender dimorphism through footprint ridge density among Iban population in Malaysian Borneo Island. The result of this present study can be well used in crime scene investigation for identification even a small portion or partial footprint is found in the crime scene. Since very limited study findings were recorded in the literature, the researchers are encouraged to continue the footprint ridge density study in various populations.

References


Bibliography