Medicolegal Importance Of Hand In Sex Identification Among Egyptian Population In Fayoum City

Thesis

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<u>Summary</u>

Sex identification is one of the most important criterion in identification of individual identity . The analysis of skull and pelvis may frustrate forensic anthropologists to determine sex through it due to its affection by different types of inhumation or physical insults . Human population exhibit some degree of sexual dimorphism . The length and extent of fingers and small bone of the hand in addition to the ratio between fingers can determine the possibility of sexual dimorphism which depend neither on the body size, height, nor age.

The present study aims to detect sex of individual from a hand or from X-ray on hand by using various parameters (length , breadth and ratio of the fingers) ,and length of metacarpal and phalanges.

This study was conducted on ٢٠٠ Egyptian volunteer(١٠٠ male and ١٠٠ female), from Fayoum , attending university hospital ,healthy , not diseased , no fracture, tumor or amputation randomly selected ٢٠-٣٥ years old from Fayoum city. Hand length, hand breadth and ratio between hand length and breadth were measured and recorded from the hand, also metacarpal length, phalangeal length, finger bone length, metacarpophalangeal length and ratio between finger bone length were measured from X-ray on the hand.

The length and breadth of hand and finger was measured using a spreading caliber (the thumb is excluded). The ratio between right

hand fingers was also measured in male and female and they were, ٢f/٣f , ٢f/٤f , ٢f/٥f , ٣f/٤f , ٣f/٥f and ٤f/٥f.

The collected data was organized, tabulated and statistically analyzed using SPSS software statistical computer package version ١٩ (SPSS Inc, USA). All results were expressed as mean, standard deviation (SD),p-value. For interpretation of results of tests of significance, non significance was adopted at P>٠,٠٥ , significance was adopted at P < ٠,٠٥ and high significance was taken on at P < ٠,٠٠١.

The mean age of the studied group of male is ٣٠,٨٨ years while that of female is ٢٩,٧٢ years old.

There were highly statistical significant difference in comparison of the mean of hand length and breadth for males and females (mean value was higher in males than in females) in both hands (P-value < ٠,٠٠١).

The mean values of length of the four metacarpal bones were significantly higher in males than females, in both hands, highly significant p-value (P-value < ٠,٠٠١).

Metacarpal bone of left hand longer than those in the right hand except for the ٢nd metacarpal in male hand and ٢nd and ٥th metacarpal in female hands.

In comparison of the mean length of the four proximal, middle and distal phalanges, there were highly statistical significant difference between males and females (mean value was higher in males than in females), in both hands (P-value < ٠,٠٠١). Proximal

middle and distal phalanges in the left hand longer than those in the right hand except for the 5th proximal phalanx in male hands . While proximal phalanx in the right hand longer than those in the left hand except for the 2nd proximal phalanx in male hand .

Regarding mean length of each finger bones and the metacarpophalanges(MCP),   there were highly statistical significant difference between males and females (mean value was higher in males than in females), in both hands (P-value < 0.001).

Metacarpophalangeal(MCP) bone length in the left hand longer than those in the right hand except for the 4th metacarpophalangeal(MCP) bone length in female hand.

Regarding measurements of Finger Bone Length ratio, there were statistical significant difference between males and females (mean value was higher in females than in males), in comparison of mean value of $2f/4f$, $2f/3f$, $2f/5f$, $3f/4f$, and $3f/5f$ in both hands, (P-value < 0.05).While $4f/5f$ ratio is non significant for sex determination.

The most accurate predictor of sex from the ratio appear in the FBL ratio $2f/5f$ followed by $2f/4f$, $2f/5f$, followed by $3f/5f$,$2f/5f$, $2f/4f$ and $3f/4f$ in the right hand.

Using ROC Curve analysis for prediction of sex in the Right hand, This study showed that all hand measurements were significant   for prediction of being male (P- value < 0.0005), except those of Finger bone length ratio $4f/5f$ which was non significant for sex determination . Total accuracy of measurements ranged from 56% to 85%. The hand breadth was coming first with highest accuracy .

Regarding sensitivity, the results show that, hand breadth and MCL$\circ$ were the most sensitive and FBL ratio ξf/ $\circ$f had the lowest sensitivity .

As regards specificity, the results reveal that, MCPLξ were the most specific variables . FBL ratio ξf/ $\circ$f had the lowest specificity .

Employing of ROC curve to study each variable independently in left hand reveal that. All hand measurements showed significant results for prediction of being male (P- value $< \cdot,\cdot\cdot\circ$) .Total accuracy of measurements ranged from $\circ\xi\%$ to $\wedge\uparrow\%$. The hand length was coming first with highest accuracy ($\wedge\uparrow$ %). FBL ratio ξf/ $\circ$f had the lowest accuracy .

Regarding sensitivity, the results show that, hand breadth was the most sensitive variable while HL/HB ratio had the lowest sensitivity.

As regards specificity, the results reveal that, hand length was the most specific variables with specificity . FBL ratio (Υf/ ξf and ξf/$\circ$f) had the lowest specificity .

Sex can be predicted from both hands by using cut off point with significant   p-value   where it is   predicted   by   all measurements. So   if a measure above cut off point (with a significant p- value) so consider it male and if a measure below cut off point (with significant p- value) so consider it female, while it is the reverse in case of finger ratio.

Applying   Multiple forward stepwise   Logistic regression analysis for sex   determination relating different hand measurements to probability of being male or female. The estimated

model fits the data adequately and was highly significant (P-value <
٠,٠٠٠١).

In right hand :

**log odds of being Male(Y) = constant(-٧٣,٩١٥) +٥,٢١٢ * Hand
breadth(+٧,٧٣٠ * DPL٤+٨,٩٠٧ * DPL٥**

Cut off point = ٠,١٢, if P is > ٠,١٢, the person is male and if P is <
٠,١٢ the person is female.

In left hand:

**log odds of being Male(Y) = constant(-٣٤٠,١٨٩) +٤٣,٢٠٠ * Hand
breadth + ٣١,٦٠١ * MCL٥ -٧٣,٢٩٨ * PPL٢ + ١٠٣,٨٧٥ * MPL٢ +
٢٦٧,٤٦٩ * DPL٢ -٢٥٦,١٧٤* DPL٣ + ١٥٩,٦٠٢* DPL٤ -٥٠٣,٦٤٨ * FBL
Ratio ٢f/٣f.**

Cut off point = ٠,٢٢, if P is > ٠,٢٢, the person is male and if P is <
٠,٢٢ the person is female.