A STUDY OF SEX DIFFERENCES IN FINGERPRINT RIDGE DENSITY AMONG AN ADULT EGYPTIAN SAMPLE USING THE AUTODESK INVENTOR SOFTWARE PROGRAM

Manal Hassan Abdel-Aziz, Nermine Ahmed AbdelHak, Wardat Attai Massoud Khamis

Department of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Alexandria University, Egypt

Introduction

- Fingerprint is one of the important biometric technologies which have drawn substantial applications now. A fingerprint is the pattern of ridges and valleys on the surface of a fingertip. Ridges and valleys usually run in parallel, sometimes terminate and sometimes bifurcate. At a fine level or local level, the characteristic of ridges and valley are known as minutiae.
- Fingerprint ridge density (RD) is defined as the fingerprint ridge count corresponding to a defined fingerprint area. It is determined by two parameters; ridge width and distance between ridges. The fingerprint ridge density has significant sexual dimorphism and has been incessantly reported in multiple populations for forensic applications.
- As the world is growing towards digitalization, the working procedures are performing fast and effectively. The computers have many uses in forensic medicine nowadays. Some software tools are there that need to be installed that gives us the benefit of fast operations especially in the field of fingerprint analysis.

Aim of the work

- The aim of this work was to determine the sex differences in the fingerprint ridge density among a sample of adult Egyptians using the Autodesk Inventor software program.

Subjects

- The present study was conducted on one hundred adult volunteers of both sexes (50 males and 50 females) aged more than 18 years old. All subjects were randomly chosen and fulfilling the following exclusion criteria:
  1. All types of physical deformity in fingers.
  2. Trauma, scar or previous surgery of fingers that leads to change in the fingerprint pattern.
  3. Subjects who were belonging to other race or other countries.

Methods

- An ethical approval was obtained from the Ethics Committee of Alexandria Faculty of Medicine on the study. An informed consent was taken from all subjects before participation in the present study.
- Subjects were asked to wash their hands with soap and water, and dry them. All ten fingers (thumb, index, middle, ring and little finger of right and left hand) of each subjects were pressed in rolling motion against the inkpad. The inked fingers were rolled against A4 white paper.
- The fingerprints were photographed and the analysis of fingerprints was done by using the Autodesk Inventor software program by which the fingerprint ridge density analysis was conducted on each fingertip surface area within two squares of 5x5 mm2 with one diagonal line in both radial and ulnar areas by using this software program.

Results

- The present study was conducted on one hundred adult volunteers of both sexes (50 males and 50 females). The mean age of male group was 22.10 ± 1.73 years while that of females was 22.06 ± 1.74 years. There was no significant difference between both sexes as regard the age where t=0.115 and p= 0.909.
- Figure (1) demonstrates that the ulnar loop fingerprint pattern was the most frequent pattern among Egyptian males and females (55.4% and 59.0% respectively) While the radial loop fingerprint pattern was of the least incidence in both sexes (5.0% of males and 5.8% of females). The current study revealed no significant difference regarding the fingerprint pattern distribution between both sexes among Egyptian population where $\chi 2$= 2.229 and p= 0.526.
- The present study revealed that the mean ridge density of the ulnar and radial areas in all fingers in females was significantly greater than that in males where p=<0.001. (Figure 2).

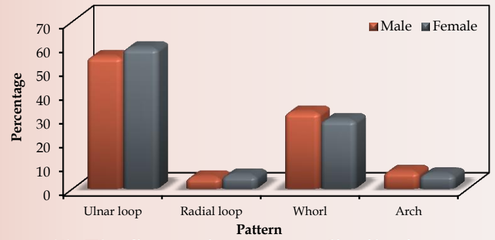

Figure (1): The fingerprint patterns distribution among adult Egyptian according to sex (n= 100)

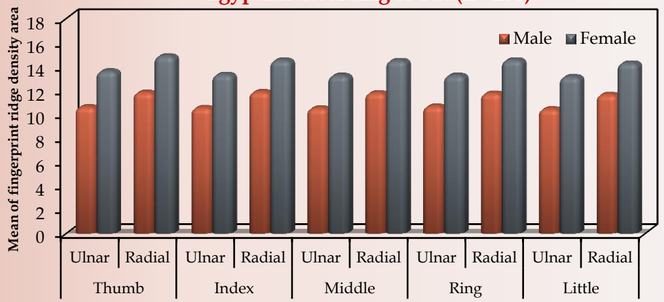

Figure (2):Comparison of fingerprint ridge density (Radial & ulnar areas) in both hands of Egyptian sample according to sex

Conclusion

- The present study shows that a statistically significant difference in fingerprint ridge density between male and female fingerprints among an adult Egyptian sample using the Autodesk Inventor software program. The study confirms that females have higher fingerprints ridge density than males. So, the ridge densities can be used as a presumptive indicator of sex determination of unknown print left at a crime scene.