



Gender Discrimination from the Appearance of Elegance Physiognomies on Hypothenar Area of Lateral Palm Prints in the Population of National Capitol Region of India

Ganjoo H, Chauhan A* and Saini A

Amity Institute of Forensic Sciences, Amity University, Uttar Pradesh, India

*Corresponding author: Amit Chauhan, Amity Institute of Forensic Sciences, Amity University, Sec-125, Noida Uttar Pradesh, India-201303, Tel: +91-9540067484; Email: amit_chauhan777@yahoo.in

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Abstract

Prominence of Fingerprints and palm prints have a very special repercussion in the identification of an individual due to its perpetuity, distinctive and ubiquitous nature since birth to the end of life. Palm prints covers a larger expanse of palmar surface, hence, probability of obtaining ridge/minutiae become higher. Since so long, it has been known to us that the fingerprints consist the class characteristics that are used to minimize the gradient of suspects. This study was carried out to determine the gender from the appearance of features on hypothenar area of palm and the percentage of class characteristics occurrence. In this study, subjects from an age group of 18-35 years from National Capitol Region of India were approached for sampling. As a resultant of this research, it was found that, arch and whorl class characteristics of palmar surfactant can help to distinguish the genders. The attained upshot shows that the Genders were successfully identified at p value 0.0067 for males and 0.0197 for females. The significance level was examined at $P < 0.01$.

Keywords: Identification; Gender Discrimination; Hypothenar Area; Palmprints

Introduction

In the era of advancement and technologies, Identification of an individual concerns by the physiological essence and other features which ought to set a ubiquitous identity which are usually considered a potential technique. Forensic science helps us to understand the actual value of evidences, their relationship with victim, suspect to prover their authenticity. As the crime arises, scientist and researcher come out with new scientific investigative tools to solve the crime. When the advance technology has taken over the traditional methods, yet, we rely over the manual examination process in some forensic respects such as fingerprints, questioned documents etc [1-4]. Palmprints is known as an emerging influential mean for personal identification with higher

confidence and has been used as a non-erring identity for the exclusion of defendants. Partial palm prints are alleged to constitute approximately 30 percent repossession from the scene of occurrence. Palm is the region between wrist and fingers. The palmar surface of hand contains many line and characteristics such as principal line, ridges, wrinkles, bifurcation dot, etc. because of enormous shallow and abundance of characteristics robust to noise and to be very highly individual and have a very high possibility to occurrence on the objects which comes in the contact of hand. Even when, an individual write, works on art or literature, daily uses things; the shallow of palm is unknowingly touches the objects and left the impressions on the shallow which remain present in discrete forms of impressions such as latent or visible, semi-visible plastic prints [5-9].

Numerous studies have been carried out over the fingerprints ridge densities, gender discrimination etc. which were carried out with the help of rolled prints. While in fact, the prints that are recovered from the scene of occurrence, consists only a few of the minutiae details from any part of fingers or palmar surface. Often the identity of any accused or suspect is based on the aggregate information of the class and individual essence which are important to minimize the list of suspects. This study was conducted to observe the occurrence of class characteristics in the palm prints specially the lower part of palm (Hypothenar area) which are mostly contracted to the objects such as questioned documents (below the writing), pots, door lock, car starting, daily usage things etc. whose results could play a vital role in the investigation and identification of suspects [10-12]. If such type of palm prints is encountered anywhere then it will be an estimation that this will be from the palm and hypothenar area.

This study was carried out to determine actual implementation of ridge details over the surface, to find out the percentage of ridges from the quartile of a finger. In this study, any kind of similarity between the ridges between male and female. As the resultant of the present study, it was observed that thumb impression, little finger impression for both of genders shows the significant difference of their presence over any surface. The ridge details show that females have highly significant lesser number of ridges in comparison of males. In both of fingers (thumb and little finger) both of genders, females have high chances in which no. of ridges may be absence [13-16]. This study may be useful to get an idea about the gender and to get an idea about the finger from which it may be implemented over the object.

Methodology

For this study, 116 samples including males and females were collected from villages Nazafgarh, Narela, Khanpur, Budhena, Khajoori Khas of Delhi and National capital region of India. All the samples were selected randomly from the from the age group of 18-35 years. All subjects were informed about the purpose of the study and verbal consent was taken prior to sampling. The subjects which were having any injury, or any cut marks present on their palmar surface or disease of palm (scars on palm, leprosy etc.) were excluded from samples. All the subjects were asked to wash/clean their hands first from sanitizers or hot water so that the dust and other ingredients could be removed.

Materials

All subjects were asked to wash their hand and dry them properly to avoid any chance of deposition of dust or moisture. After drying hands, fingerprinting black ink was applied over the palmar surface on both of the hands by using the cotton and then subjects were asked to implement their

palmar surface over the A4 size white sheet. All the samples were preserved at room temperature inside the white paper envelope to avoid the destruction from the atmospheric dirt and moisture.

Methods

For the determination of class characteristics and individual characteristics, the hypothenar area of palmar surface was focused. Small dots were not counted, while all other individual features such as forks, lakes were counted as two ridges. Now for the gender discrimination, in each square (9mm²) of the lower palm prints (Hypothenar area), all the ridges were counted from one edge to the diagonally adverse edge. Shown in Figure 1.

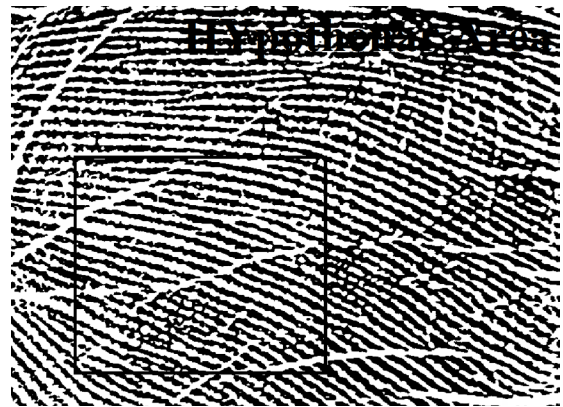


Figure 1: lower area of palm print (hypothenar area).

During the examination and analysis of samples, a hand lens of 5X, 10X magnification power were used, while the photographs were taken by the Samsung Galaxy J7, 13 megapixels' camera. All the calculations were done by using the advance technology including Microsoft office excel. The comparison of means for means of both of hands and gender discrimination were executed using two tailed fashion *t*-test as embedded in SPSS version 17.0 [17,18].

Result and Discussion

In hypothenar area (Lower part of palm), all the ridges enter from the main principal lines and exits towards the ulnar side of the palm either by bifurcating at the end or ridge ending, or in wrinkle form, but each and every exit form an individual essence in form of identity. If such type of essence is studied properly, the principal lines at the lower part of thenar area and between the inter-digital pad IV present a significant values, that is either can be measured or the ridge counting can be done when compared to the specimen [19-21]. As per the objective of this study, all the samples were studied to determine the occurrence of class characteristics

in the palmar surface of subjects. The observations are given below in Table 1.

Elegance Physiognomies	Male	Percentage	Female	Percentage
Loop	31/59	52.54%	29/57	50.87%
Arch	17/59	28.81%	11/57	19.29%
Whorl	11/59	18.64%	07/57	12.28%

Table 1: Observed elegance physiognomies and their percentage in lateral palm print for both genders.

Out of total loop pattern (60% in total), the percentage of loop pattern in males were 52.54% while in females, it was 50.87%. The occurrence of other two class characteristics in males namely; arch and loop were 28.82% & 18.64% while in females, it was 19.29% & 12.28% which is lesser in comparison of males.

Graph: Comparative graph of class characteristics occurrence on the palmar surface.

Hereafter, the individual characteristics from the fixed area were studied. As per the resultant, occurrence of these features is given below in Table 2.

S. No.	Individual Physiognomies	Male	Percentage	Female	Percentage
1.	Ridges	768	(13.17%)	839	(14.71%)
2.	Bifurcation	352	(61.75 %)	402	(70.52%)
3.	Enclosure	05	(0.80%)	07	(1.22%)
4.	Bridge	12	(2.02%)	11	(1.90%)
5.	Short Ridge	81	(14.21 %)	93	(16.31%)
6.	Dot	06	(1.05%)	06	(1.05%)
7.	Trifurcation	38	(6.66%)	47	(8.24%)
8.	Ridge Crossing	00	00	12	(2.10%)
9.	Double Bifurcation	03	(0.50%)	01	(0.10%)
10.	Island	05	(0.80%)	06	(1.05%)
11.	Ending Ridge	16	(2.80%)	15	(2.67%)
12.	Eye	01	(0.10%)	02	(0.30%)
13.	Spur	05	(0.80%)	03	(0.50%)

Table 2: Observed several types of individual physiognomies and their percentage for both genders.

The obtained percentage of the data represents the occurrence of individual characteristics in the palmar surface of an individual. As per the results, it was noticed that the bifurcation percentage is quite higher in palmar surface along with short ridge, trifurcation for both genders. The comparative table of both of genders will help to determine

the gender of suspect. Although, Numerous studies have been carried out so far for the gender discrimination from the ridge counting. For this study, the gender discrimination was conducted from 9 mm² of area. The mean values of the ridge count for both genders are given below in Table 3.

Age group (Years)	Mean value of ridge count for male subjects in 9mm ²	No. of subjects	Mean value of ridge count for female subjects in 9mm ²	No. of subjects
18-25	7.97	59	8.73	57
26-35	8.13	59	9.86	57

Table 3: Mean values of ridge count/9 mm² in the lateral palm print for both genders.

Ridge counting was performed for both genders in an age group of 18-25 years and 26-35 years. As per the observations,

the mean value of male ridges was approximate 8 ridges/9 mm² while in case of females, the ridges were 9 ridges /9

mm². While in an age group of 26-35 years, the males have an average 8 ridges/ 9 mm² and females have 10 ridges/9 mm². It represents that there is high significant difference between the mean values of ridges for both genders. The significance level of the study was examined at $P < 0.01$. The obtained results were highly significant for gender discrimination. Significant level is given below. The obtained

values of the ridges for both genders can be helpful during an investigation. The Palm prints can be used a potential evidence for personal identification which shares most of the discriminative essence similar like fingerprints and posses a large area in comparison of other shallows and the analysis of ridges can be used in comparison since it is unique and persist for human in Table 4.

Gender	Age (Years)	Std. Dev.	Std. Error	P-Value	T-Value	Significant Level
Male	18-25	1.143	0.185	0.0067	-3.3412	$P < 0.01$
Female	26-35	1.49	0.228	0.0197	-2.9819	$P < 0.01$

Table 4: Statistical analysis of the ridge density for both genders.

Conclusion

Since Palm prints is emerging in the field of biometric and investigation as an evidence in field of intensification often over-looked at the scene of occurrence, questioned documents and other aspects. When the samples were carefully evaluated, it was found that the occurrence of individual essence except principal line such as bifurcation, ridge ending, short ridge, dots, etc. were present which are Ubiquitous to each and every individual while the class characteristics (Arch, Whorl, Loop) were absent. It makes palm prints a favorable field of investigation which is used for identification. Implementation of such type of prints on documents and other surfaces can contribute in identity of suspect and will make easy to identify the exact location of prints and its values can be impart in the field of fingerprints, questioned documents (Wills, notes, suicidal letters, official letters, etc.).

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Ethical Consideration: NA

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