Distribution of Fingerprint Patterns in North: Indian Population

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Abstract

The study of epidermal ridge pattern of finger, sole and palm is known as Dactylographic or Dactyloscopy. The Dactyloscopy relays on the analysis on the pattern type. There are greater and progressive advancement in the field of forensic fingerprint and technologies related to this analysis like recording, lifting, and developing of prints under different conditions. Fingerprints are the chief and paramount importance in the field of forensic investigation. These are unique, difficult to alter and durable over the life of an individual. Identification using the fingerprints is outright and unerring. At the crime scene, identification can be made by comparing very small portion of ridges left. The present study was carried out among 500 peoples, 250 males and 250 females of North Indian population belonging to age between 10-80 years with the aim to found the most popular pattern found in North Indians mainly Haryanvi's. The rolled fingerprints were taken using by the ink method and their patterns were identified. This prospective study was carried out over the period of approx 6 months. The results showed the majority of population having the Loop pattern that is 57.5% of total population.

Keywords: Dactyloscopy; North Indians; Loops; Whorls; Arches.

Introduction

The study of ridge pattern of fingers, sole, and palm is known as Dactyloscopy. The word Dactyloscopy origin from the ancient Greek word (daktylos means "finger") and (skopeō means "look at").[1,2] It is the process of comparing two finger ridges skin impression are likely to have same origin or not. Fingerprints is an impression of ridge outline which appears on the anterior surface of finger of the proximal, middle and distal phalanges and same on the thumb.[3,6] It is the raised portion of epidermis on the finger and toes and these ridges sometimes also known as epidermal ridges. These are reproduction of friction skin ridges present on the palmar of hand and sole of the feet.[7] These ridges designed to provide former grip and resistance to slip. The pores present in between of these ridges,from which perspiration is discharge due to which impression was deposited on the surface.[4,5] The study of pores is known as Poroscopy. The science of Poroscopy was established in 1912 by Sir Edmond Locard in France.

The fingerprint is one of the most important and valuable evidence which is generally find at the place of the scene of crime. It is so important due to their uniqueness, availability, universality and permanency. Fingerprint evidence is perhaps the most common type of physical evidences found at the crime scene.[8,11,13] Their development and identification helps to prove criminal physical presence at the scene of crime. It is extremely difficult for the criminal to commit the crime without leaving behind his fingerprints in cases such as theft, burglary, house breaking etc.; unless

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they wears gloves but from the gloves also there are chance to lift the prints. Since the ridges present on epidermal surface of finger and palm emit a film of perspiration of oily matter. There is a tendency for ridge impression to adhere to non-porousobject that person may touch.[9,10] On the basis of visibility, fingerprint can be classified into 3 categories i.e. Patent, Latent and Plastic. The forms of latent prints sometimes smudge, partial, incomplete left as crime scene unknowingly or by chance by peritrator.[12] So the present study is an attempt to the determined the distribution of the different kind of patterns among the population of north Indians mainly people belong to Haryana.

Material and Methodology

The aim of the study is to find out and analyse all ten digit fingerprints of an individual and analyse different patterns among the different age groups. The main aim to understand the big picture of fingerprints taken from 500 Haryana citizens mainly from Faridabad and Gurugram in which 250 are females and 250 are males aged belong to 10 to 80 years were taken in the month of December to May in year 2019–20. The whole study takes the time of aprox 6 months.

The materials used in the study were black ink, magnified lens, pencil and performa. The entire sample was taken in fingerprint card (shown in fig. 1). The inkless fingerprint pad was used for taking prints

People with any kind of deformities, permanent scars and any extra finger or bandage finger were excluded from the study. The verbal content of all the subjects was obtained after properly explanation about the objectives of the study to them. The entire subjects are requested to wash their hand with the ether or alcohol and dried completely to remove dirt, grease and sweat. In this study take the rolled fingerprint, all ten digits; rolled from nail to nail. Then the plain impressions are used to verify the accuracy of rolled fingerprints. The subjects are allowing rollingof their fingers in the ink pad and then allow rolling it on the given space in the fingerprint card. Roll the finger on the ink pad in such a way that entire fingerprint pattern area is evenly covered with the ink. Ink should be covered from one edge to the nail to the other and from the crease of the first joint to the tip of the finger. The limited amount of ink was used with the limited pressure. During the time of lifting of fingerprint on the card extra care should be taken to avoid the smudging. All the 10 digits fingerprint was taken in the same method and at last plain impression were taken. In this individual's finger, keeping together and press on the paperin their allotted space after applying on the ink. Repeat the same process for the both thumbs.

After the fingerprint acquired, personal detail such as subject's name, age, sex, height etc. were taken with their signatures. Each subject assigned the serial number. In last prints that were taken were analysed under a magnified lens and studied

Fig. 1: Fingerprint Card

for indentified for patterns i.e. Loops, whorls, and arches based on the appearance of ridges lines.

Result and Observation:

Table 1: Distribution of primary fingerprint patterns among the subject.

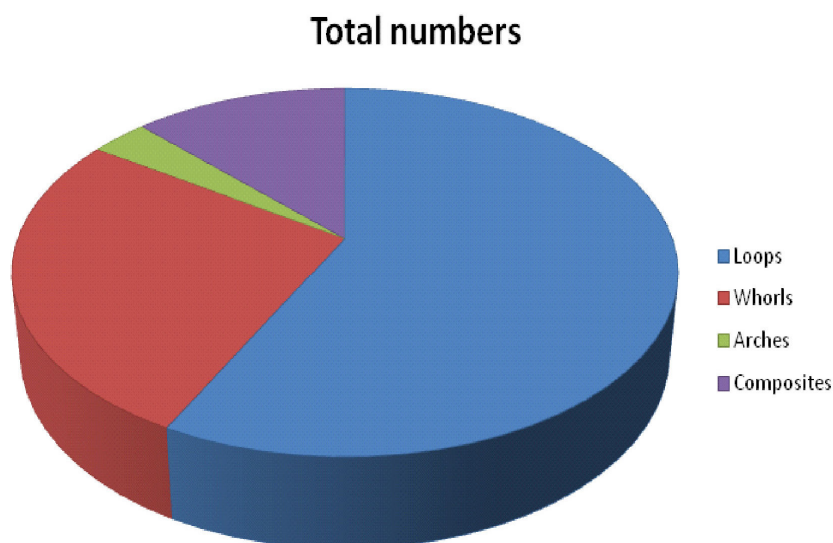| Fingerprint Pattern	Total Number	Percentage
Loop	2875	57.5%
Whorl	1340	26.8%
Arches	165	3.3%
Composites	620	12.4%
Total	5000	100%

Total numbers

Fig. 2: Distribution of fingerprint patterns

Table 2: Distribution of loops, whorls, arches and composites with their percentage.

Digits		Number	Loops	%	Whorls	%	Arches	%	Composites	%
Thumb	Right	500	275	55.0%	170	34.0%	0	0.0%	65	13.0%
	Left	500	324	64.8%	127	25.4%	1	0.2%	56	11.2%
	Total	1000	599	59.9%	297	29.7%	1	0.1%	121	12.1%
Index	Right	500	243	48.6%	149	29.8%	49	9.8%	53	10.6%
	Left	500	212	42.4%	156	31.2%	53	10.6%	60	12.0%
	Total	1000	455	45.5%	305	30.5%	102	10.2%	113	11.3%
Middle	Right	500	357	71.4%	63	12.6%	15	3.0%	104	20.8%
	Left	500	307	61.4%	99	19.8%	15	3.0%	106	21.2%
	Total	1000	664	66.4%	162	16.2%	30	30.0%	210	21.0%
Ring	Right	500	215	43.0%	216	43.2%	9	1.8%	40	8.0%
	Left	500	224	44.8%	209	41.8%	2	0.4%	77	15.4%
	Total	1000	439	43.9%	425	42.5%	11	1.1%	117	11.7%
Little	Right	500	372	74.4%	59	11.8%	19	3.8%	24	4.8%
	Left	500	346	69.2%	92	18.4%	2	0.4%	35	7.0%
	Total	1000	718	71.8%	151	15.1%	21	2.1%	59	5.9%
Total	Right	2500	1462	58.5%	657	26.3%	92	3.7%	286	11.4%
	Left	2500	1413	56.5%	683	27.3%	73	2.9%	334	13.4%
	Total	5000	2875	57.5%	1340	26.8%	165	3.3%	620	12.4%

Sample 1

Sample 2

Sample 3

Sample 4

Sample 5

Sample 6

Sample 7

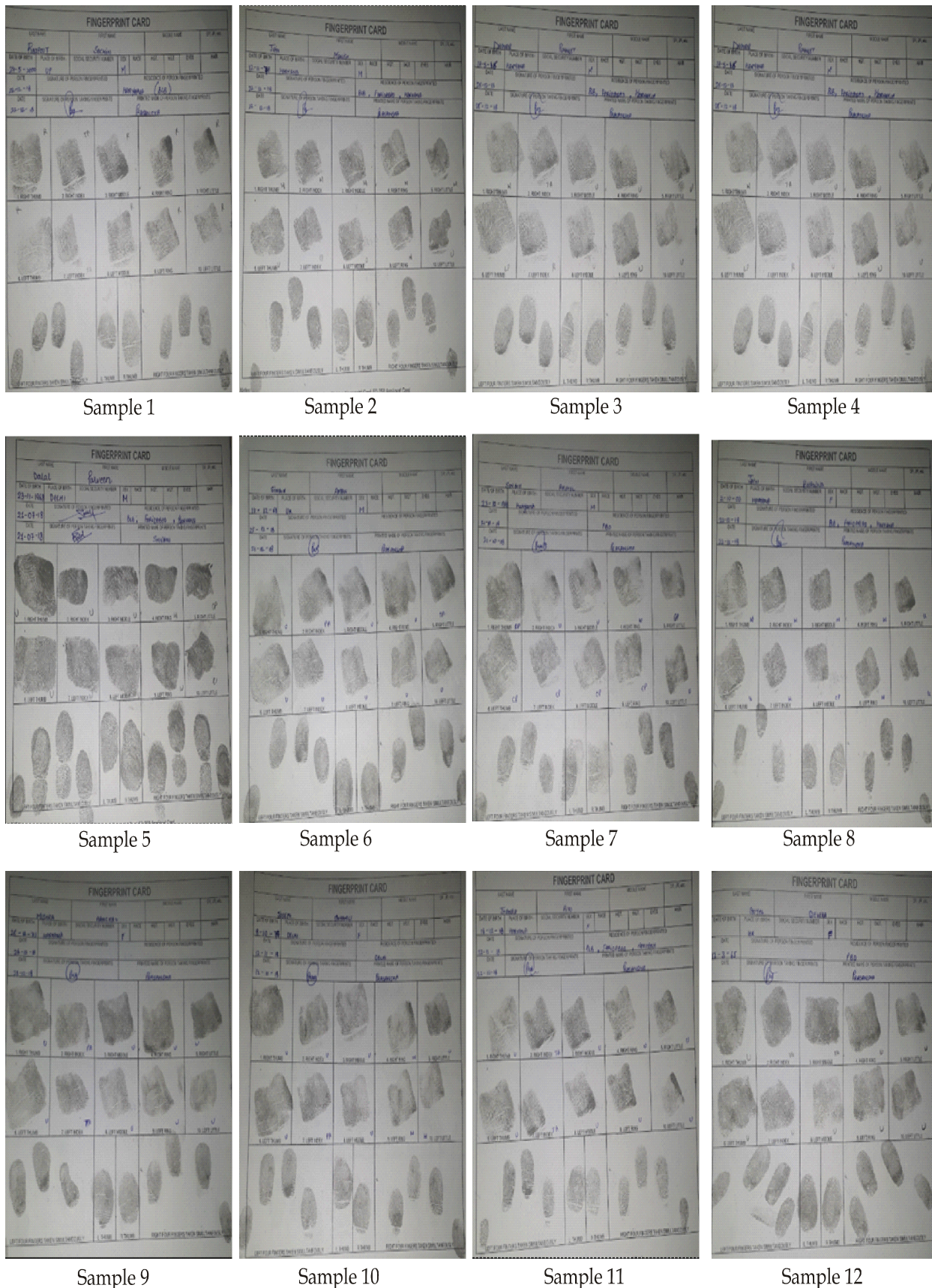Sample 8

Sample 9

Sample 10

Sample 11

Sample 12

Table 3: Showing some of the Fingerprint sample taken from the North - Indian population

Discussion

Fingerprint pattern are very unique and remain unchanged throughout the life. Even the two identical twins don't have the same fingerprints patterns. Hence, it plays a very important role in forensic investigation. The first work was done in the China, aprox 3000 years back, to sign the legal documents. After that there is a long history of the fingerprints but the main and most important event take place when Bertillon began his work on the fingerprint system. William Herschel, British civil servant, started fingerprints for personal identification, i.e. mainly right hand imprints to sign the legal contracts but that time his motive remain unclear. The advantages of using the fingerprint pattern as a mean of identification. After that Faulds work on the fingerprint and suggest that there is different kind of fingerprint patterns or ridges which gave important in the investigation of criminals. The system of classification was given by Sir Francis Galton, by published his book on "Finger Prints" and this classification is even use today, is a modified version of the system proposed by Sir Francis Galton and was modified by Sir Edward Henry and this classification is known as Henry's System of Classification or Henry Galton method. This is the most effective and efficient method use by almost all over the universe. There are four basic fingerprint patterns which are used in this study which are:Loops, Whorls, Arches and Composites. Loops can be seen in almost 60 to 70% of the world population fingerprints. Loop can be distinguished by how the loop flows on the hand. Loop pattern has one delta and one core. There are 3 types of the loop pattern i.e. Ulnar loop, Radial loop and Double loop. Arches are the least seen among the population. It's about only 5 % and there is no delta. The ridges run continuously from one side to the other side of the finger. There are 2 types of arch pattern i.e. plain arch and tented arch. Whorls can be seen in about 22 to 30% of the fingerprints. Pattern that contains two or more deltas will be a whorl and can be categorised in 3 groups, i.e. plain whorl, central pocket and accidental.

Conclusion

The present studyprominence that the loop patterns are the predominating and arches are the least occurring in the North Indian population. It may help in increasing the authenticity of fingerprints in identification of individuals and solving of crimes. The result was obtained that in the overall population loop pattern have the highest frequency i.e. 57.5% and the arches having the lowest frequency i.e. 3.3%. The whorls contain the 26.8% of total population. In table 2, Loop patterns were prevalence in the Little finger and in the middle finger but the Whorls were prevalence only in the ring finger. Arches were more seen in the index finger and composites were mostly found in the middle finger. Thus, different pattern were seen their preferences in the different digits.

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