

Study of Fingerprint Patterns in North Indian Population

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Abstract

Study of finger prints study for identification is known as Dactylography or Dactyloscopy. With advances in the field of forensic sciences finger prints have been used as a very effective means of establishing identity of the individual. The present study was conducted on 500 subjects reporting in the outpatient department of ITS Dental College Hospital & Research Centre, Greater Noida, UP. The subjects selected were in age range between 15 and 80 years. Fingerprints were obtained using inked stamp pad. Each type of fingerprint pattern was identified and analyzed for gender differences and its distribution in population. **Key Words:** Dactylography, fingerprint pattern, gender difference, Forensic Sciences

Date of Submission: 05-03-2020

Date of Acceptance: 19-03-2020

I. Introduction:

The Methods of identification by studying fingerprint patterns is known as DERMATOGLYPHICS or DACTYLOSCOPY or DACTYLOGRAPHY.^[2] The word Dactylography has been taken from the two Greek words Daktylos meaning "finger" and graphene meaning "to write".^[3] The study of the impression of patterns which is formed by the papillary ridges on the bulbs of fingers and thumbs and the impression of which are taken upon unglazed paper with the help of printer's ink.^[4,5,6] Dactylography is a progressing science and newly adopted method for recording fingerprint patterns.

Fingerprint impressions has been used as a tool in Assyria as an evidence of good faith in the sealing of bonds or the issue of documents back as in 17th century AD^[2]. Dr. Henry faults recognized the importance of finger prints and published an article in NATURE in 1880.^[7,8] First finger print study was done by Sir Francis Galton in 1892. Sir Edward Richard Henry (IGP) improved the applied aspect of Galton's observation by classifying the prints for practical application in the field of identification in 1890's. The system of fingerprint study is still most effective in most of the countries of the world popularly known as HENRY GALTON system or GALTON system of identification.^[2,7,3]

Characteristics of Fingerprints:

Fingerprints are present at birth, on epidermis and dermis. They appear at 12th to 16th week of intrauterine life and they get fully formed by 24th week of intrauterine life. The ridges appear on the fingers first followed by palm and sole.^[1,2]

PERSISTENCY: They remain constant for the whole life and this was demonstrated by HERSCHEL.^[9]

VARIETY: Fingerprints form patterns which are not absolutely identical not even in identical twins.^[2,3,5,8]

IMMUTABILITY: Simple injuries, old age, diseases will not change the formation of patterns and ridge characteristics, unless dermis is affected.

Classification:

LOOP: in loop pattern the ridges make backward turn, but without twist with one delta

TYPES OF LOOP

ULNAR LOOP: The ridges about the core terminate in the direction of the ulna bone of the forearm or simple terms the ridges about the core slant towards the right in case of right hand fingers and towards left in case of left hand fingers

RADIAL LOOP: The ridges about the core terminate in the direction of radius bone of forearm, i.e the ridges slant towards left in case of right hand fingers and towards right in the left hand fingers.^[1,12]

WHORLS: IN this pattern some of ridges make a turn through at least one complete circuit. There are two deltas. One on the left and the other on the right.^[1,12]

Whorls can be:
Concentric /circular
Spiral
Double core
Elliptical /almond shaped

ARCH: This pattern can be of two types:

Plain Arch: In this pattern the ridges run from one side to another side making no backward turn. There is usually no delta.

Tented Arch: In this pattern the ridges near the middle may have an upward thrust arranging themselves as it were on both sides of an axis towards which adjoining ridges converge. The ridges thus converge give to them pattern the appearance of a tent in outline hence has the name tented arch.

COMPOSITE or COMPOUND: A composite pattern means combination of two or more patterns either of the same or different type in one point.^[1]

TYPES OF COMPOSITE PATTERNS ARE;

CENTRAL POCKET LOOP: it can be described as an incipient whorl because a few ridges about the core possess features of whorl type and remaining ridges conform the loop type surrounding them as a pocket.

LATERAL POCKET LOOP: when the ridges constituting a loop bend sharply downwards on one side before recurving thereby forming an interspace or pocket on that side ordinarily filled by the ridge of another loop. In lateral pocket loop the ridges containing the point of core have their exit on the same side of delta

TWINNED LOOP: it consists of two well defined loops one superincumbent on or surrounding the other in this pattern the ridges containing the point of core have their exit on different sides of the delta.

ACCIDENTAL: it is comparatively uncommon type of pattern being one of the more complicated combination of the same or different patterns i.e. loop by loop, whorl resting on loop, loop resting on whorl, whorl resting on whorl, arch with pocket etc.

II. Materials and Methods

Five hundred subjects (250 males and 250 females) are selected in ITS DENTAL COLLEGE, GREATER NOIDA, UTTAR PRADESH from AUGUST 2019 to 2019 for the study.

The subjects age was taken between 15 and 80 years.

Material used: Duplicating ink, magnifying lens, A4 sheet paper

Method used: Hands were washed and dried to remove sweat, dirt and grease. The rolled impressions of each finger were obtained using inked stamp pad. Thus rolled finger prints were obtained. Similarly, prints of entire ten fingertips were prepared for each and every subject

III. Results

Rolled fingerprint of both the hands of all 500 subjects were collected. which were analyzed and their patterns were determined.

Among the 500 subjects it was seen that loops were 374, whorl were 98, composite were 8 and arches were 20. shown in (table 1).

Distribution of different pattern of fingerprint was analyzed separately for both males and females. shown in (Graph 1)

Present study showed that in males the most common type of pattern was loop (32.40%) followed by whorl (7.00%) and then arch (1.60%) and composite (0.60%).

In females the most common type was loop (42.40%) followed by whorl (12.60%) and then arch (2.40%) and composite (1.00%).

we compared about the most dominant type of fingerprint among the 4 pattern of fingerprint and it was found that the commonest type was loop pattern (374 cases) among all 4 patterns followed by whorl (98 cases) and arch (20 cases) least common was composite (8 cases)

We compared different finger print pattern in different gender and we found out that loop form fingerprint pattern was dominant in both males (32.40%) as well as in females (42.40%). Second most common type of fingerprint pattern was whorl in male (7%) and in female (12.60%) followed by composite in male (0.60%) and in female (1.00%) and arch in males (1.60%) and females (2.40%) (Table 1).

We compared our present study with a previous study and we found out that there was no change in the commonest type of fingerprint pattern, it followed the same pattern with the commonest being the loop pattern followed by whorl (table 2).

Overall frequency distribution of all types of fingerprint in either sex was tabulated.

IV. Discussion:

Aim of this study was to study various patterns of fingerprint and their distribution in north Indian population.

Most common pattern was loop and least common was composite.

Prevalence of fingerprint patterns as given by other authors and that obtains in the present study was compared in (table 2).

When we compared previous data with the present it was found that

- 1) Prevalence of loop is between 57.1% according to previous data and is 74.8% according to the present study
- 2) Prevalence of whorl is between 30.4% and in present study it is 19.4%
- 3) Prevalence of composite pattern is quoted to be (6.4%) by previous data, but it is found to be lesser in this study (1.6%).
- 4) Prevalence of arch pattern is quoted to be 6.2% by previous data, but it is found to be slightly lesser in this study 4%.

On analyzing the distribution of fingerprint pattern in either sex, loops we see the predominant pattern in both the gender followed by whorls and then arch and composite.

V. Conclusion:

In this study, distribution of types of fingerprints was made out. Loop pattern is the predominant type, and composites are the least common type. This comparative data also give a useful insight to the racial origin of northern Indian and southern Indian population and thus can be related to their Aryans and Dravidian ancestry. But more studies are required with larger sample size to substantiate the result and to use it as an important tool for forensic sciences.

TABLE 1 FINGER PRINTS PATTERN AND GENDER DISTRIBUTION

**FINGERPRINTS PATTERN AND GENDER DISTRIBUTION
(Table 1)**

PATTERN	CASES (M)	%	CASES(F)	%		%
ARCH	8	1.60%	12	2.40%	20	4.00%
COMPOSITE	3	0.60%	5	1.00%	8	1.60%
LOOP	162	32.40%	212	42.40%	374	74.80%
WHORL	35	7.00%	63	12.60%	98	19.60%
Grand Total	208	41.60%	292	58.40%	500	100.00%

GRAPH 1: DISTRIBUTION OF FINGER PRINT PATTERN

Distribution of Different Patterns of FingerPrints

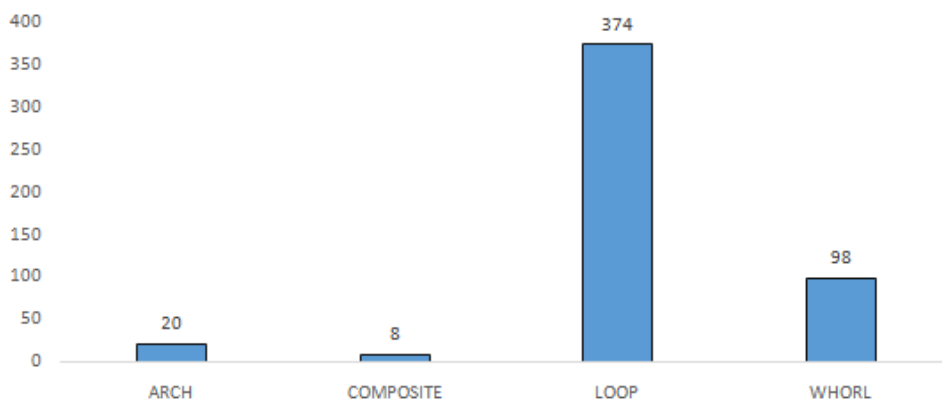


TABLE: 2 COMPARISION OF FINGER PRINT PATTERN DISTRIBUTION BETWEEN VARIOUS POPULATIONS

Pattern	Percentage in previous study (South India Population)	Present in present study (North India Population)
Loops	57.1	74.8
Whorls	30.4	19.4
Arches	6.2	4
Composites	6.4	1.6

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Aadil Hassan, etal.“ Study of Fingerprint Patterns in North Indian Population.”*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(3), 2020, pp. 31-34.