



## Study of Distribution of Finger Print Patterns Among Population in South Tamilnadu.

### KEYWORDS

Identification, Finger prints, Dactylography

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**ABSTRACT** Personal identification through fingerprints has been recognized since long time and is regarded as the greatest contribution to the law enforcement. Through its unique characteristics, the science of fingerprint provides a special service in the admission of justice and also in other areas where positive identification is of paramount importance. Study of fingerprints is known as Dactylography or Dactyloscopy, and at present it is also known as Henry-Galton system of identification. Identification by this method is absolute, without any chance of error, provided there is no fallacy in the procedure. This study was conducted on patients attending the Out Patients Department of Government Rajaji Hospital , Govt.Madurai Medical College, Madurai, to know the distribution of various finger print patterns. The most frequent pattern among population of Madurai and neighbouring districts is Ulnar loop .

### INTRODUCTION

The mere word "Identification" implies various meanings at various situations or its meaning varies with tasks involved. In Forensic Medicine identification stands for "Determination of individuality of a person".

The following characters are usually noted for the purpose of identification, like race, sex, age, complexion and features, hair, fingerprints, footprints, lip prints, teeth marks, deformities, tattoo marks, scars, occupational marks, handwriting, clothes, personal articles, speech or voice, gait, brain mapping (Brain imprint) and DNA profile / DNA finger print etc.,

Out of these plethora of methods, fingerprint system is the best, which stood stands the test of the time, and it has been estimated that the probability of two persons having identical finger impressions is about one in sixty four thousand million population of the world. Surprisingly, even the fingerprints of identical twins are not similar.<sup>1</sup>

Personal identification through fingerprints has been recognized since long time and is regarded as the greatest contribution to the law enforcement. Through its unique characteristics, the science of fingerprint provides a special service in the admission of justice and also in other areas where positive identification is of paramount importance.<sup>2</sup>

Study of fingerprints is known as Dactylography or Dactyloscopy, and at present it is also known as Henry-Galton system of identification. Identification by this method is absolute, without any chance of error, provided there is no fallacy in the procedure.<sup>3</sup>

Sir Edward Richard Henry modified Galton's – Arch, loop, whorl system and classified them into four main groups according to the percentage of their distribution in the whole population of the world, these are

- Loop (65 – 67%)
- Whorl (25%)
- Arch (6-7%) and
- Composite or accidental or chance (3-4%)

This Henry system of classification is the most efficient and is in almost universal use.

### AIM

To study the distribution of various patterns of Finger prints among the population in south Tamilnadu.

### MATERIALS AND METHODS

The present study was conducted at Department of Forensic Medicine at Govt. Madurai Medical College , Madurai after obtaining ethical committee approval.

### Inclusion Criteria:

Total subjects included were 250 Males and 250 Females. Subjects attending the Out Patients Department of Government Rajaji Hospital , Govt.Madurai Medical College, Madurai.

### Exclusion Criteria:

Subjects where there was any evidence of injury of fingertips that leads change in the fingerprint pattern (Leprosy, scars of the fingertips, lacerations).

Informed written consent was obtained prior to taking the fingerprints with proper procedure explained to the subjects.

### Materials: Glass slab – Inking Roller method

The materials which were used for this study are as follows:

1. Printer Black Ink-Kores quick drying duplicating ink.
2. Glass Plate (12x12 inches)
3. Ink roller.
4. A magnifying hand lens was used to study the fingerprints .
5. Pencil.
6. Measuring Scale.

**Methodology:** The subject was asked to wash and dry their hands to remove dirt and grease. For collection of fingerprint, a plain glass plate of 12x12 inches was cleaned uniformly smeared with a thin layer of black printers ink by using the inking roller. The subject was asked to keep his / her arm relaxed and not to try to help in rolling the fingers

as this may cause smearing. Then the finger bulbs were rolled on the glass slab- "the thumbs were rolled towards the subject's body and the fingers were rolled away from the body, i.e., thumb in fingers out method."

And then the rolled impressions of each finger were obtained. In this way for each and every individual the entire prints of ten fingers were prepared. Only rolled prints were taken i.e. no plain prints.

**Statistical Tools**

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using **spss software**.

Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. chi-square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

**RESULTS**

**Table 1 : Pattern of little finger in both hands(Males)**

Pattern	Little finger			
	Left		Right	
	No	%	No	%
Tented Arch	5	2	3	1.2
Central Pocket Loop	12	4.8	12	4.8
Exceptional Arch	2	0.8	6	2.4
Plain Whorl	38	15.2	59	23.6
Radial Loop	-	-	1	0.4
Simple Arch	1	0.4	1	0.4
Twinned Loop	5	2.0	1	0.4
Ulnar Loop	185	74.0	166	66.4
Accidentals(X)	2	0.8	1	0.4
Total	250	100	250	100

Among males included in the study, Ulnar Loop was the predominant pattern of little finger in the left ( 74%) hand and right hand ( 66.4%) followed by Plain Whorl ( 15.2% and 23.6%) (Table:1).

**Table 2 : Pattern of ring finger in both hands(Males)**

Pattern	Ring finger			
	Left		Right	
	No	%	No	%
Tented Arch	5	2.0	3	1.2
Central Pocket Loop	19	7.6	20	8.0
Exceptional Arch	5	2.0	6	2.4
Plain Whorl	129	51.6	148	59.2
Radial Loop	-	-	-	-
Simple Arch	4	1.6	5	2.0
Twinned Loop	5	2.0	3	1.2
Ulnar Loop	82	32.8	65	26
Accidentals(X)	1	0.4	-	-
Total	250	100	250	100

In the ring finger of males plain whorl was present in majority of cases (51.6% in left hand and 59.2% ) in right hand(Table:2).

**Table 3 : Pattern of middle finger in both hands(Males)**

Pattern	Middle finger			
	Left		Right	
	No	%	No	%
Tented Arch	11	4.4	4	1.6
Central Pocket Loop	6	2.4	3	1.2
Exceptional Arch	4	1.6	9	3.6
Plain Whorl	44	17.6	39	15.6
Radial Loop	-	-	3	1.2

Simple Arch	15	6.0	10	4.0
Twinned Loop	16	6.4	18	7.2
Ulnar Loop	154	61.6	160	64
Accidentals (X)	-	-	4	1.6
Total	250	100	250	100

Ulnar Loop was present in maximum percentage of cases ( 61.6% in left hand and 64% in right hand) in the middle finger of males(Table:3).

**Table 4 : Pattern of index finger in both hands(Males)**

Pattern	Index finger			
	Left		Right	
	No	%	No	%
Tented Arch	15	6.0	11	4.4
Central Pocket Loop	10	4.0	7	2.8
Exceptional Arch	8	3.2	8	3.2
Plain Whorl	68	27.2	92	36.8
Radial Loop	24	9.6	23	9.2
Simple Arch	20	8.0	21	8.4
Twinned Loop	16	6.4	15	6.0
Ulnar Loop	85	34	72	22.8
Accidentals(X)	4	1.6	1	0.4
Total	250	100	250	100

The predominant pattern of the index finger of males was Ulnar Loop in the left hand ( 34%) and plain whorl in the right hand ( 36.8%)(Table:4).

**Table 5 : Pattern of thumb finger in both hands(Males)**

Pattern	Thumb			
	Left		Right	
	No	%	No	%
Tented Arch	3	1.2	1	0.4
Central Pocket Loop	7	2.8	7	2.8
Exceptional Arch	4	1.6	3	1.2
Plain Whorl	50	20	83	33.2
Radial Loop	-	-	1	0.4
Simple Arch	12	4.8	7	2.8
Twinned Loop	45	18	37	14.8
Ulnar Loop	128	51.2	111	44.4
Accidentals (X)	1	0.4	-	-
Total	250	100	250	100

Ulnar Loop was present in majority of cases in the thumb fingers of males included in the study ( 51.2% in left hand and 44.4% in the right hand)(Table:5).

**Table 6 : Little finger patterns (Females)**

Pattern	Little finger			
	Left		Right	
	No	%	No	%
Tented Arch	7	2.8	4	1.6
Central Pocket Loop	11	4.4	7	2.8
Exceptional Arch	6	2.4	10	4.0
Plain Whorl	45	18	47	18.8
Radial Loop	1	0.4	-	-
Simple Arch	1	0.4	1	0.4
Twinned Loop	3	1.2	1	0.4
Ulnar Loop	175	70.0	180	72
Accidentals (X)	1	0.4	-	-
Total	250	100	250	100

Nearly three fourth of the left and right hand little fingers of females studied exhibited Ulnar Loop pattern(Table:6).

**Table 7 : Ring finger patterns(Females)**

Pattern	Ring finger			
	Left		Right	
	No	%	No	%
Tented Arch	6	2.4	6	2.4
Central Pocket Loop	19	7.6	14	5.6
Exceptional Arch	8	3.2	4	1.6

Plain Whorl	117	46.8	109	43.6
Radial Loop	3	1.2	2	0.8
Simple Arch	1	0.4	-	-
Twinned Loop	1	0.4	2	0.8
Ulnar Loop	95	38	113	45.2
Accidentals (X)	-	-	-	-
Total	250	100	250	100

Plain whorl was the predominant pattern (46.8% in the left hand and 43.6% in the right hand ) in the ring finger of females in this study group(Table:7).

**Table 8 : Middle finger pattern(Females)**

Pattern	Middle finger			
	Left		Right	
	No	%	No	%
Tented Arch	22	8.8	9	3.6
Central Pocket Loop	4	1.6	1	0.4
Exceptional Arch	10	4.0	7	2.8
Plain Whorl	57	22.8	27	10.8
Radial Loop	-	-	1	0.4
Simple Arch	8	3.2	6	2.4
Twinned Loop	12	4.8	9	3.6
Ulnar Loop	136	54.4	190	76
Accidentals (X)	1	0.4	-	-
Total	250	100	250	100

Middle finger of females included in the study had Ulnar Loop as the predominant pattern in both hands ( 54.4% and 76%)(Table:8).

**Table 9 : Index finger pattern(Female)**

Pattern	Index finger			
	Left		Right	
	No	%	No	%
Tented Arch	24	9.6	8	3.2
Central Pocket Loop	7	2.8	7	2.8
Exceptional Arch	6	2.4	13	5.2
Plain Whorl	76	30.4	64	25.6
Radial Loop	20	8.0	6	2.4
Simple Arch	18	7.2	13	5.2
Twinned Loop	7	2.8	14	5.6
Ulnar Loop	87	34.8	124	49.6
Accidentals (X)	5	2.0	1	0.4
Total	250	100	250	100

Ulnar Loop was present in majority of index fingers of females in the study group (34.8% in left and 49.6% in right hand)(Table:9).

**Table 10 : Thumb fingers pattern(Females)**

Pattern	Thumb			
	Left		Right	
	No	%	No	%
Tented Arch	2	0.8	1	0.4
Central Pocket Loop	2	0.8	2	0.8
Exceptional Arch	1	0.4	2	0.8
Plain Whorl	61	24.4	60	24.0
Radial Loop	1	0.4	2	0.8
Simple Arch	9	3.6	7	2.8
Twinned Loop	58	23.2	37	14.8
Ulnar Loop	115	46	138	55.2
Accidentals (X)	1	0.4	1	0.4
Total	250	100	250	100

Thumb fingers in 46% of left hand and 55.2% of right hand of females had Ulnar Loop pattern(Table 10).

**Table 11 : Finger print pattern of males and females**

Pat-tern	Male				Female			
	Left	Right	Total		Left	Right	Total	
			No	%			No	%
AT	39	22	61	2.4	61	28	89	3.6

CPL	54	49	103	4.1	43	31	74	3.0
EA	23	32	55	2.2	31	36	67	2.7
PW	329	421	750	30	356	307	663	26.5
RL	24	28	52	2.1	25	11	36	1.4
SA	52	44	96	3.8	37	27	64	2.6
TL	87	74	161	6.4	81	63	144	5.8
UL	634	574	1208	48.3	608	745	1353	54.1
X	8	6	14	0.6	8	2	10	0.4
Total	1250	1250	2500	100	1250	1250	2500	100

The predominant finger print pattern of males and females was Ulnar Loop (48.3% among males and 54.1% among females) followed by Plain Whorl (30% and 26.5%)(Table11).

**Expansion of Abbreviations'**

- Radial loop - RL
- Ulnar loop - UL
- Plain whorl - PW
- Central pocket loop whorl - CPL
- Twinned loop - TL
- Accidental - X
- Tented arch - AT
- Simple arch - SA
- Exceptional arch - EA
- Left little finger - LLLF
- Right little finger - RLF
- Left ring finger - LRF
- Right ring finger - RRF
- Left Middle Finger - LMF
- Right Middle Finger - RMF
- Left Index Finger - LIF
- Right Index Finger - RIF
- Left Thumb - LTh
- Right Thumb - RTh

**DISCUSSION**

The discovery of uniqueness of fingerprints caused an immediate decline in the prevalent use of anthropometric methods of identification and led to the adoption of fingerprints as a more efficient method of identification. <sup>4</sup>

In present study 250 Male and 250 Female subjects were included to take fingerprint by glass slab method at the outpatient Department of Govt. Rajaji Hospital, Madurai.

**FREQUENCY OF THE FINGERPRINT PATTERNS**

In Present study the Ulnar loop was the most frequently observed pattern followed by Plain Whorl, in the total subject population in all ten digits The least frequently observed pattern in the total population were simple arches, twinned loops, tented arches, radial loops, accidental types and Exceptional arches both in Male and Female.

Igbigbi P.S., Msamati B.C (2002) reported in a study on dermatoglyphics on indigenous black Zimbabweans, they found that ulnar loops were the most predominant digital pattern type in both sexes, followed by whorls in males and arches in females. <sup>5</sup>

Similar findings were noticed in the present study except arches in Females as stated in the above study. In contrast to this it is found in the present study that the frequency of arches is more in Males.

Gangadhar. M.R, Rajashekara Reddy. K (1983) reported in a study that the basic finger pattern type loops (57.11%) were common followed by whorls (27.89%) and arches (15.00%) in the general population with significant sex difference and insignificant bilateral difference. <sup>6</sup>

Almost similar findings are observed except for arches. Whereas in the present study central pocket loops replaces arches in comparison with above said study. The sex difference in the present study is with Ulnar loop being more in Females and whorls being more in Males.

Purkait R, (2003) observed in his comparative study on frequency of fingerprint patterns and variation in the ten digit classification on males (454 samples – 227 from each tribe) of Mundas and Lodhas, a tribal group of Midnapur district in West Bengal where Mundas exhibit higher frequency of whorl and loop patterns while loops are more frequent among Lodhas. <sup>7</sup>

These findings are almost in consistent with the present study findings, loops followed by whorls.

After reviewing our observation and other studies results it is felt that uniqueness of fingerprint for an individual exist, but region wise variation in fingerprint pattern and sexual dimorphism is noticed.

### CONCLUSION

following conclusions were drawn based on the study of finger prints:

Fingerprints are unique for each person and can be used for positive identification.

Fingerprints do not show sexual dimorphism.

The most frequent pattern among population of Madurai and neighbouring districts is Ulnar loop in the total population as well as sex distribution.

### REFERENCES

1. Modi J.P. Modi's Medical Jurisprudence and Toxicology. 22<sup>nd</sup> Ed. Nodia: Lexis Nexis Butterworths: 2002:37, 39, 40 & 72.
2. Nath S. Fingerprint Identification. 1<sup>st</sup> Ed New Delhi : C.G.O Pvt. Ltd; 1991:7-8.
3. Nandy A. Principles of Forensic Medicine. 1<sup>st</sup> Ed, Kolkatta: New Central Book Agency; 1995:92.
4. H.T.F Rhodes, Alphonse Bertillon : Father of Scientific Detection. Abelard-Schuman, New York, 1956.
5. Igbigbi P.S., Msamati B.C. Palmar and Digital dermatoglyphics of Indigenous black Zimbabweans: Med Sci Monit.2002 Nov; 8(II): 757-761.
6. Reddy C.C. Finger Dermatoglyphics of the Bagathas of Araku Valley, India. Am. J. Phy Anthropol 1975; 42:225-8.
7. Purkait R. Fingerprint Classification: A comparative study among Mundas and Lodhas. JMFT 2003 Vol. XIV No one; 31-32.