

**Original article:**

## **Pattern of fingerprints and their relation with blood groups**

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### **Abstract:**

Dactylography or the fingerprint system is based on the study of epidermal ridges and their configurations [Dermatoglyphics (derma = skin + glyphs=curves)] in the fingers, palms and soles Two persons having identical finger prints is about one in 64 thousand millions. The combined effect of heredity and environment arbitrates the pattern of ridges. This study was carried out in the Department of Forensic Medicine and Toxicology, Karuna Medical College, Chittur, Palakkad during the period 2014-2015. 100 students (27 male & 73 female) belonging to the age group 17-25 years of known blood group were randomly selected for the study with the objective of studying the pattern of finger prints on all the fingers of both hands and their association with blood groups. The study revealed that there is an association between distribution of fingerprint patterns, blood group and gender. Loop was most frequently seen fingerprint followed by whorl arch and composite. O positive is most common blood group and AB negative is absent. Loops are predominant in blood group O followed by B and A in Rh positive subjects, followed by whorls. Arch and composite were common among O and A positive subjects.

**.Key words:** Identification, Finger Print, Dermatoglyphics, ABO blood group.

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### **Introduction:**

The skin on the palmar and plantar surface is continuously wrinkled with narrow minute ridges known as friction ridges. A finger print is an impression of the friction ridges on all parts. The finger prints appear for the first time on the human fingers, palms, soles, and toes from 12<sup>th</sup> to 16<sup>th</sup> week of embryonic development and their formation gets completed by the 14<sup>th</sup> week i.e. about the 6<sup>th</sup> foetal month. Dactylography or the fingerprint system is based on the study of epidermal ridges and their configurations [Dermatoglyphics (derma = skin + glyphs=curves)] in the fingers, palms and soles <sup>(1)</sup>. The term dermatoglyphics was coined by Cummins <sup>(2)</sup>.

Two persons having identical finger prints is about one in 64 thousand millions. The combined effect of

heredity and environment arbitrates the pattern of ridges. Galton classified the types of finger prints depending upon their primary pattern as loops, whorl, arches and composite <sup>(3)</sup>. The loop is the most common of all the patterns. These are formed by ridge lines that flow in from one side of the print, sweep up like arch, and then curve back around and flow out on the side from where they entered. There are two types: radial or ulnar, depending on which side of the finger the lines enter. The whorl patterns are of four different types: plain, central pocketed double loop, and accidental whorl. These have at least two deltas and one or more of the ridge lines curve around the core to form a circle or spiral or other rounded, constantly curving form<sup>(4)</sup>. Arches are the simplest and also rarest patterns. There are two types: plain and tented arches. In both types the ridge

lines flow from one side, rise in the middle of the pattern and flow out to the other side of the print. The term composite is used for combination of patterns that does not fit into any of the above classification.

Blood group system was discovered way back in 1901 by Karl Landsteiner. So far 19 major groups have been identified which vary in their frequency of distribution amongst various races of mankind. Clinically, only 'ABO' and 'Rhesus' groups are of major importance. 'ABO' system is further classified as A, B, AB, O blood group types according to presence of corresponding antigen in plasma. 'Rhesus' system is classified into 'Rh +ve' and 'Rh -ve' according to the presence or absence of 'D' antigen<sup>(5)</sup>.

#### **Objective:**

1. To study the pattern of finger prints on all the fingers of both hands.
2. To study the association between finger prints and blood groups.

#### **Material and Methods:**

The present study was carried out in the Department of Forensic Medicine and Toxicology, Karuna Medical College, Chittur, Palakkad during the period 2014-2015. 100 students (27 male & 73 female) belonging to the age group 17-25 years of known blood group were randomly selected for the study. Proforma was prepared on a durable white paper divided into two, marked as right and left, and each further into five columns (marked as thumb, index, middle, ring and little), the finger prints were taken using the stamp pad of CAMLIN Company of size 157×96 mm. Finger prints were taken after washing the hands with soap water and after complete drying. The patterns of finger prints (loops, whorl, arches and composite) were observed with the help of hand lens. Both rolled and plane prints of right and left hand

were taken. After obtaining the finger prints the basic details such as name, age and sex was also gathered. Blood groups of all the persons were also noted for further study. If the blood group wasn't known then the blood group was identified using antiserum A, B and D.

Note: Subjects with permanent scars on their fingers or thumbs, with any hand deformities due to injury, were excluded from our study.

#### **Results:**

Out of 100 subjects, 73 (73%) were female and 27 (27%) were male; the female-male ratio being 73:27. Most common blood groups were 'O' positive 40 (40%) and 'B' positive 27 (27%) followed by 'A' positive 14 (14%). B negative and O negative, AB positive, A negative, are rarer being present in 7(7%), 6(6%), 4(4%) and 2(2%) and respectively, as shown in the table 1 and table 2. AB -ve subjects were absent in the present study. Out of 100 subjects, 85 (85%) belonged to Rh positive and 15 (15%) belonged to Rh negative. The percentage of Rh negative individuals was as usual less in the study.

In table 3, distribution of the fingerprint patterns of all the fingers in both the hands is seen. Total number of the loops seen in all the fingers of both hands were 542(54.2%). Followed by total number of whorls 407(40.7%), and Arches were 36(36%) and the least number of fingerprint pattern was composite type 15(15%). This clearly shows that loops rule the chart followed by whorls arches and composite.

Table 4 shows the distribution of primary fingerprint patterns among the males and females. In females Loops were common 402(40.2%) followed by whorls 298(29.8%), arches 36(36%) and composite 09(9%). Similarly the same pattern was observed in male subjects, loops 140(14%), followed by whorls 109(10.9%), arches 16(16%), and composite 6(6%).

Distribution of fingerprint patterns among various blood groups with their Rh factors was studied as shown in table 5. More number of loops were observed in O+ve subjects 221(40.77%) followed by B+ve 137(25.27%), A+ve 61(11.25%). They are observed almost equally 45(8.3%), 43(7.9%) among B -ve and O -ve subjects respectively. Whorls again were predominant among O+ve 151(37.1%), followed by B+ve 127(31.2%), A+ve 65(15.97%)

subjects. Least number of loops and whorls was seen among A-ve subjects 11(2.7%) and 6(1.47%) respectively. Arch pattern was seen among O+ve subjects 17(47.2%), followed by A+ve 10(27.77%). Composite type was seen almost equally among O+ve and A+ve subjects 6(40%) and 4(26.66%) respectively. Arch and Composite are seen less among O-ve subjects.

Table 1: Distribution of blood groups according to gender

Sex	A+ve	A-ve	B+ve	B-ve	AB+ve	AB-ve	O+ve	O-ve
Male N=27 (%)	04(4)	01(1)	06(6)	01(1)	0	0	13(13)	02(2)
Female N=73 (%)	10(10)	01(1)	21(21)	06(6)	04(4)	0	27(27)	04(4)
Total N=100	14	02	27	07	04	0	40	06

(%) = Percentage

Table 2: Distribution of subjects according to their Rh factor of their blood groups.

Blood group	Rh +ve	Rh -ve
A	14(14%)	02(2%)
B	27(27%)	07(7%)
AB	04(4%)	0
O	40(40%)	06(6%)
Total	85	15

(%) = Percentage

Table 3: Distribution of the primary fingerprint patterns of all the fingers in both the hands.

Fingerprint pattern	Total number	Percentage (%)
Loops	542	54.2
Whorls	407	40.7
Arches	36	3.6
Composite	15	1.5
Total	1000	100

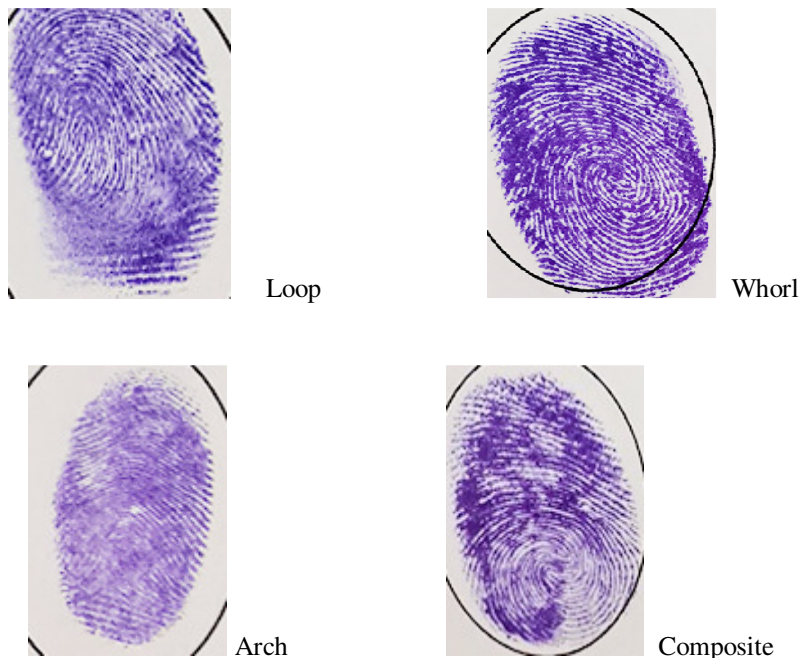
Table 4: Distribution of fingerprint patterns among males and females:

Fingerprint patterns	Males (N=27)		Females (N=73)	
	Number	Percentage	Number	Percentage
Loops	140	14%	402	40.2%
Whorls	109	10.9%	298	29.8%
Arches	16	16%	20	20%
Composite	06	6%	09	9%
Total	271	27.1%	729	72.9%

Table 5: Distribution of fingerprint patterns among A, B, AB, and O blood groups with their Rh factors

Fingerprint pattern	A group		B group		AB group		O group		Total
	Rh +	Rh -	Rh +	Rh -	Rh +	Rh -	Rh +	Rh -	
Total loops	61	11	137	45	24	0	221	43	542
Percentage (%)	11.25	2.7	25.2	8.3	4.4	0	40.7	7.9	54.2
Total whorls	65	06	127	23	13	0	151	22	407
Percentage(%)	15.9	1.4	31.2	5.6	3.1	0	37.1	5.4	40.7
Total arch	10	02	03	0	03	0	17	01	36
Percentage(%)	27.7	5.5	8.3	0	8.3	0	47.2	2.7	3.6
Total composite	04	0	03	0	01	0	06	01	15
Percentage(%)	26.6	0	0.2	0	6.6	0	0.4	6.6	1.5

Figures: Finger Print Patterns



#### Discussion:

Fingerprint pattern followed the general rule in this study showing loops, whorls, arches and composite pattern which is consistent with other studies<sup>(6, 7, 8, 9, 10, 11)</sup>. Blood group O+ve and B+ve were common<sup>(10, 11, 13)</sup> and rarest were A-ve, B-ve, O-ve and AB group is absent in this study, showing Rh positive subjects outnumbered Rh negative subjects. Loops were seen in highest number among both male and females<sup>(13)</sup>, followed by whorls, which differed with the other studies<sup>(6, 10)</sup>. In this study loops were found to be higher in O+ve blood group which is similar in the study done by<sup>(6, 7, 8, 9, 10, 13)</sup>. Some studies have shown loops were common among A group<sup>(11)</sup>. Whorls were also seen predominant among O+ve group followed by B+ve group similar with the other studies<sup>(7, 9, 12)</sup>.

Whorls were observed least among A-ve subjects. Arch and composite pattern was more common in O+ve subjects compared to A+ve subjects<sup>(8, 12)</sup>, but not consistent with other studies<sup>(7, 9)</sup>.

#### Conclusion:

Fingerprint evidence is undoubtedly the most reliable and acceptable evidence till date in the court of law. Due to immense potential of fingerprints as an effective method of identification an attempt has been made in the present study to analyse their correlation with gender and blood groups of an individual, which may in turn enhance the authenticity of the fingerprints in identification of an individual. We may hence conclude that there is an association between distribution of fingerprints, blood group and gender.

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