

## Original Research Article

## A Study of Pattern of Fingerprints in Relation to Blood Groups

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**Abstract: Background:** Fingerprint patterns are unique in each individual and the chance of two persons having identical fingerprints is about one in 64 thousand millions. The fingerprint ridges formed during foetal period do not change their course or alignment throughout the life of an individual. Finger prints are useful in forensic investigation especially for identification purpose and detection of various crimes. **Objectives:** The present study was conducted to correlate between fingerprint patterns in ABO, Rh blood groups and to evaluate their significance. **Methods:** A total 186 second year MBBS students of Andhra Medical College, Visakhapatnam India, with known blood groups from age group 17-22 years male and female were included in the study. Fingerprints were obtained by Ink method. Parameters studied Loops, Whorls, Arches, composite. **Results:** The general distribution pattern of finger print showed high frequency (55.65%) of loops followed by whorls and arches. Blood groups majority of the subjects (45.16%) in the study were of blood group O followed by blood group B, A and AB of whom 94.08% were Rh-positive. Highest frequency of loops was seen in O positive blood group followed by B positive. **Conclusion:** There is an association between distribution of finger print pattern and blood groups.

**Keywords:** Fingerprints, Blood Group, Loops, Whorls, Arches, Gender, Identification.

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## INTRODUCTION

Dermatoglyphics (Fingerprints) is study of the epidermal ridges and their configuration on the volar aspect of fingers, palms and soles. The term dermatoglyphics was coined by Cummins (Cummins, H. 1926). The term coined by Cummins and Mildo (1943). It includes anthropologic, genetic and Egypt logic study of finger prints (Umranिया, Y. N. *et al.*, 2013). The ridge pattern depends upon cornified layer of epidermis as well as dermal papillae. The characteristic patterns of epidermal ridges are differentiated in their primitive forms during third and fourth month of foetal life (Purkinje, J. E. 1940). Herschel used fingerprints for personal identification in India (Herschel, W.J. 1880) Galton classified the types of finger prints depending upon their primary pattern as loops, whorl and arches (Galton, F. 1892). The epidermal ridges of palm fingers are fully developed at birth & thereafter remain unchanged for life (Fayrouz, I. N. E. *et al.*, 2012), except trauma or burns to the particular area of fingers.

The different population reveals wide variation in frequency of papillary patterns on the finger ball and also wide variation in blood groups. Bloterogel expressed a correlation between physical characters and

blood groups (Bloterogel, H., & Blutgrype, B. W. 1934). Fingerprints are effective method of identification an attempt has been made in the present work to analyze their correlation with gender and blood group of an individual. This correlation between fingerprint pattern and these parameters may help in using fingerprints as an important aid in sex and blood group determination and vice versa, thus, enhancing the authenticity of fingerprints in detection of crime and criminals. Fingerprint (dermatoglyphic) evidence is undoubtedly the most reliable and acceptable evidence till date in the court of law.

## AIMS AND OBJECTIVES:

- To study the pattern of fingerprints in Indian population.
- To study the pattern of blood groups in Indian population.
- To observe any correlation between pattern of fingerprints and blood groups

## MATERIALS AND METHODS

The present study prospective was carried out in the Department of Forensic Medicine & Toxicology at Andhra Medical College, Visakhapatnam, India

during the period 2017-18. Total 186 medical students were randomly selected for study, out of which 97 were females and 89 were males. All the subjects were healthy with known blood groups and their age ranged from 17 to 22 years. Written informed consent was taken from the study subjects.

For collection of fingerprints, a plain plastic plate slab of 12 × 8 inches was cleaned and uniformly smeared with a thin layer of black printer’s ink (Kores quick drying duplicating ink) by using the inking roller. The finger bulbs were rolled on the glass slab, and then the rolled impression of each finger was obtained in the

allotted space for that finger on the proforma, and plane prints of all fingers both hands also taken to avoid misidentification of fingers.

Basic details such as name, age, sex were noted. Blood groups of all the candidates were also noted down. Subjects with scars on fingers, with deformities were excluded from the study. After taking the prints, they were analysed under a magnifying lens. Primary fingerprint patterns (loops, whorls, arches, composite) were observed, variables were tabulated and analysed by descriptive analysis.

## RESULTS AND OBSERVATIONS

In the present study, 186 students were taken, out of which 97 were females and 89 were males.

**Table 1:** Distribution of cases according to Blood groups

Gender	Blood groups				Total
	A	B	AB	O	
Male	20 (10.75%)	29 (15.59%)	5 (2.69%)	35 (18.82%)	89 (47.85%)
Female	19 (10.22%)	24 (12.90%)	5 (2.69%)	49 (26.34%)	97 (52.15%)
Total	39 (20.97%)	53 (28.49%)	10 (5.38%)	84 (45.16%)	186 (100%)

Table 1 shows that maximum 84 (45.16%) of the study subjects belong to O blood group whereas AB

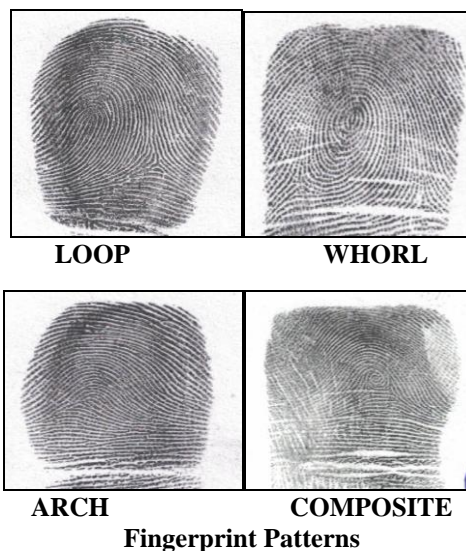
blood group contributes minimum 10 (5.38%) of the study subjects

**Table 2:** Distribution of cases according to Rh Blood groups

Blood group	Rh Positive	Rh Negative	Total
A	39 (20.97%)	0 (0%)	39 (20.97%)
B	47 (25.27%)	6 (3.26%)	53 (28.49%)
O	80 (43.01%)	4 (2.15%)	84 (45.16%)
AB	09 (4.84%)	1 (0.54%)	10 (5.38%)
<b>Total</b>	<b>175 (94.09%)</b>	<b>11 (5.91%)</b>	<b>186 (100%)</b>

Table 2 shows that maximum 175 (94.09%) of the study subjects belong to Rh positive group, out of which 80 (43.01%) belonged to blood group O, 47 (25.27%) of blood group B, 39 (20.97%) of blood group A and 9 (4.84%) belonged to AB positive blood group.

Total Rh negative cases in this study were 11 (5.91%), out of which 6 (3.26%) each were of blood group B, 4 (2.15%) belongs to blood group O and 1 (0.54%) of blood group AB.



**Table 3:** General distribution of primary finger print patterns in all fingers of both hands

Patterns of finger print	Total	Percentage
Loops	1035	55.65%
Whorls	620	33.33%
Arches	149	8.01%
Composite	56	3.01%
Total	1860	100%

Table 3 shows distribution of primary fingerprint patterns of all the fingers of both hands of all the subjects. Loops had the highest frequency 1035

(55.65%) followed by whorls with 620 (33.33%), arches with 149 (8.01%) and composites showed the least number with 56 (3.01%).

**Table-4:** Distribution of fingerprint patterns according to gender

Patterns of finger print	Male	Female
Loops	490 (55.06%)	545 (56.19%)
Whorls	313 (35.17%)	307 (31.65%)
Arches	56 (6.29%)	93 (9.59%)
Composite	31 (3.48%)	25 (2.58%)
Total	890 (100%)	970 (100%)

Table 4 shows distribution of fingerprint patterns according to gender. Frequency of loops were found to be higher in females (56.19%) compared to that of males (55.06%). Whorls higher in males

(35.17%) compared to females (31.65%) and arches were seen higher in females compared to males. Composites showed little higher in males.

**Table 5:** Distribution of finger print patterns among subjects of A,B,O & Rh Blood groups (n=1860)

Fingerprint patterns	Blood Group A		Blood Group B		Blood Group AB		Blood Group O		Total
	Rh +ve	Rh -ve	Rh +ve	Rh -ve	Rh +ve	Rh -ve	Rh +ve	Rh -ve	
Loops (%)	256 13.76%	0	244 13.12%	27 1.45%	42 2.26%	10 0.54%	436 23.44%	20 1.07%	1035 55.65%
Whorls (%)	87 4.67%	0	178 9.56%	32 1.73%	41 2.20%	0	263 14.13%	19 1.02%	620 33.33%
Arches (%)	38 2.04%	0	32 1.73%	1 0.05%	3 0.16%	0	74 3.97%	1 0.05%	149 8.01%
Composite (%)	09 0.48%	0	16 0.86%	0 0%	4 0.22%	0	27 1.45%	0 0%	56 3.01%
Total	390 20.96%	0	470 25.27%	60 3.23%	90 4.84%	10 0.54%	800 43.01%	40 2.15%	1860 100%
	20.96%		28.5%		5.38%		45.16%		

Table 5 shows distribution of fingerprint patterns among different blood groups with Rh factors. Loops had the highest frequency in all Rh positive and Rh-negative blood groups followed by whorls and arches. O positive blood group had the highest number

of all the patterns among Rh positive blood groups. Among Rh negative, loops and whorls were more in blood group B, arches are equal in B & O blood group. Composites were more in O +ve group, followed by B +ve blood group.

**Table 6:** Fingerprint patterns among Rh+ve and Rh-ve blood groups

Pattern	Rh+ve	Rh-ve	Total
Loops	978 (52.58%)	57 (3.07%)	1035 (55.65%)
Whorls	569 (30.59%)	51 (2.74%)	620 (33.33%)
Arches	147 (7.90%)	2 (0.11%)	149 (8.01%)
Composite	56 (3.01%)	0 (0%)	56 (3.01%)
Total	1750 (94.08%)	110 (5.92%)	1860 (100%)

Table 6 shows that loops 52.58%, whorls 30.59%, arches 7.90% and composite 3.01% of the study subjects belong to Rh positive group, whereas Rh negative cases in this study were loops 3.07%, whorls 2.74%, arches 0.11% composite are 0%, over all loop's percentage is highest in both Rh+ve and Rh-ve blood groups.

## DISCUSSION:

Fingerprint pattern followed the general rule in this study showing loops, whorls, arches and composite pattern which is consistent with other studies (Sangam, M. R. *et al.*, 2011; Bhavana, D. *et al.*, 2013; Raloti, S. K. *et al.*, 2013; Mehta, A. A., & Mehta, A. A. 2011; Ekanem, A. U. *et al.*, 2014; & Bharadwaja, A. *et al.*,

2004). Blood group O+ve and B+ve were common (Ekanem, A. U. *et al.*, 2014; & Bharadwaja, A. *et al.*, 2004; & Maled, V. *et al.*, 2015) and rarest A-ve 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 (Maled, V. *et al.*, 2015), followed by whorls, which differed with the other studies (Ekanem, A. U. *et al.*, 2014; & Sangam, M. R. *et al.*, 2011). In this study loops were found to be higher in O+ve blood group which is similar in the study done by (Bhavana, D. *et al.*, 2013; Raloti, S. K. *et al.*, 2013; Mehta, A. A., & Mehta, A. A. 2011; Ekanem, A. U. *et al.*, 2014; Ekanem, A. U. *et al.*, 2014; Bharadwaja, A. *et al.*, 2004; Sangam, M. R. *et al.*, 2011). Some studies have shown loops were common among A group (Bharadwaja, A. *et al.*, 2004). Whorls were also seen predominant among O+ve group followed by B+ve group similar with the other studies (Bhavana, D. *et al.*, 2013; & Mehta, A. A., & Mehta, A. A. 2011). Whorls were observed 0% in A-ve and AB-ve subjects. Arch common in O+ve subjects compared to A+ve subjects and composite pattern was more common in O+ve subjects followed by B+ve, A+ve and AB+ve subjects (Raloti, S. K. *et al.*, 2013), but not consistent with other studies (Bhavana, D. *et al.*, 2013; & Mehta, A. A., & Mehta, A. A. 2011).

## CONCLUSION:

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. Fingerprint evidence is undoubtedly the most reliable and acceptable evidence till date in the court of law. Fingerprint patterns can be of help in predicting the gender and blood group of an individual and solving of crimes.

- Loops were the most commonly found pattern and composites the least.
- Blood group O positive was the most common and AB negative was found to be the rarest.
- Rh positive blood groups were more compared to Rh negative blood groups, which is proved in this original study and significant based on the statistical data also
- Loops and arches were highest in females, whorls and composite were highest in males.
- Loops were predominant in all the blood groups.

The result of this study is significant as it can help the investigators to determine the blood group from the fingerprint pattern and vice versa investigating the crime. We conclude that there is an association between distribution of fingerprints, blood group and gender.

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