

RIGHT HAND FINGERPRINT PATTERN AND THEIR RELATION WITH BLOOD GROUPS

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Abstract

Background: Among the various identification methods used, fingerprints are constant and individualistic and form the most reliable criteria for identification. Dactylography is the process of taking the impressions of the papillary ridges of the fingertips for the purpose of identification of a person. Identification by this method is absolute, without any chance of error. **Aim:** To find out correlation with right hand fingerprint pattern and blood group of an individual. **Materials and Methods:** The basic three fingerprint patterns of right hand of 250 medical students were compared with their 'ABO' blood groups. In one method, for collection of fingerprints, a plain glass plate of 12x12 inches was cleaned uniformly smeared with a thin layer of black printers' ink by using the inking roller. And in second method, LEE Fingerprint Pad was used to take 100 fingerprints. **Result:** It was observed that distribution of fingerprint patterns in relation to blood groups among the thumb and little finger were statistically significant. majority of the subjects were from 'O' group (96 - 38.4%) followed by 'B' (79-31.6%), 'A' (59-23.6%) and 'AB' (16 - 6.4%) groups. Loops were the most commonly seen fingerprint pattern which were common with O blood group. **Conclusion:** The association of blood groups with fingerprint patterns was statistically insignificant. Hence, the prediction of blood group of a person is possible to an extent on the basis of the person's fingerprint pattern.

INTRODUCTION

To establish the identity of a person, identifying features are to be noted. The various identification data used are fingerprints, tattoos, moles, scars, handwriting, bite marks, hair, and dental examination, chromosomal studies, DNA fingerprinting etc. Fingerprints are constant and individualistic and form the most reliable criteria for identification. [1] Dactylography is the process of taking the impressions of the papillary ridges of the fingertips for the purpose of identification of a person. Identification by this method is absolute, without any chance of error. [2]

Fingerprint patterns found on the skin of the palmar and plantar surface is continuously wrinkled with narrow minute ridges known as friction ridges. It is the study of ridged skin found on the finger pad, palms and soles. [3]

The possibility of two persons having identical fingerprints is about one in sixty-four thousand million. [4]

Fingerprint patterns are genotypically determined and remain unchanged from birth till death. [5] Studies have also reported a significant association between fingerprint patterns and blood groups. [6] The question of identification of a living person is mostly the concern of the police and is raised in the court of law in connection with absconding criminals and soldiers or accused in rape, assault and murder. So, any correlation with the trace evidence is very important for further investigation of the crime. This study was an attempt to find out correlation with right hand fingerprint pattern and blood group of an individual. [7]

MATERIALS AND METHODS

This study was conducted in the Department of Forensic Medicine and Toxicology, AIMS School of Medicine, Kochi with the help of the Department of Transfusion Medicine, AIMS School of Medicine and Fingerprint Bureau, Ernakulam.

Study Group

The study group comprised of medical students of AIMS School of Medicine. Students from each respective year (1st year, 2nd year, 3rd year and 4th year) were being randomly selected from Amrita School of Medicine.

Sample Size

Sample size based on the percentage distribution of subjects with respect to fingerprint patterns loops, whorls, arches and with 95% confidence and 20% allowable error, minimum sample size came to 575 arches, 100 loops and 180 whorls. Due to the constraint of time period, I included a total of 250 subjects. This gives the estimate with 30% allowable error for arches, 13.0% allowable error for loops and 18.0% allowable error for whorls.

Inclusion Criteria

- Subjects who were healthy and having normal hands.

Exclusion Criteria

- Subjects who had any evidence of injury of fingertips that leads to change in the fingerprint pattern (scars of the fingertips, lacerations, sweaty hands)
- Rh factor was excluded for comparison (both Rh factors were considered under the same blood group).
- Those subjects not consenting to be a part of the study

Methodology Method 1

The subject was asked to wash and dry their hands to remove dirt and grease for the collection of fingerprints, 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 of right hand 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. Then the impressions of each finger were obtained in the allotted space for that finger on the proforma. In this way for each individual the entire prints of ten fingers were prepared. Only plain prints were taken.



Figure 1: (a) Printer Micro Inks; (b) Glass plate 12x12 inches; (c) Ink roller

Method 2

Pre-inked pad, also known as LEE Fingerprint Pad, measuring, 6 x 4.5 cm where the ink is company

filled and can be used to take 100 fingerprints was used. Advantages of this fingerprint pad are - will not stain fingers, clear, crisp print are obtained and can be used on any paper. The recording of fingerprints was similar to that of procedure 1, except that instead of the glass slab fingerprint pad was used. A single fingerprint was used for 60 subjects.



Figure 2: (a) LEE fingerprint pad; (b) Pre-inked pad

Blood Grouping

Blood group of the subjects, being medical students had already been determined by the Amrita Blood Bank and documented. Therefore, a subsequent test was not needed. The information was obtained from the following records medical records, blood donor's forum and driving license.

Statistical Analysis

Percentage distribution of different fingerprint patterns according to different fingers and according to blood groups were computed and tabulated. To test the statistical significance of the association of blood group and fingerprint pattern at each finger and also for the total fingers Chi-square test was done. p-value of less than 0.05 was taken as statistically significant. Statistical analysis was done using SPSS-version 20.

RESULTS

The basic fingerprint patterns of the right thumb were compared with the four blood groups. Loop prints were more in 'O' blood group (36.70%) and least seen in 'AB' blood group (8.20%). Whorl was seen commonly in 'O' blood group (41.80%) and absent seen in 'AB' blood group (4.10%). Arch was seen in 'B' blood group (80.00%) and absent in 'A' and 'AB' blood groups.

Table 1: Distribution of finger print patterns of right thumb in relation to blood group

Right Thumb	Blood Group (%)			
	B	O	A	AB
LOOP (147)	27.90	36.70	27.20	8.20
WHORL (98)	34.70	41.80	19.40	4.10
ARCH (5) *	80.00	20.00	0.00	0.00
Total (250)	31.60	38.40	23.60	6.40

*Not included in statistical test of significance due to small sample size P-value: 0.516

In the right index finger loop pattern was most seen in 'O' blood group (35.20%) and least common in 'AB' blood group (7.40%). In the right index finger whorls were commonest in 'O' blood group

(41.70%) and least in 'AB' blood group (6.20%). Arch was seen mostly in 'O' blood group (40.60%) and least common seen in 'AB' blood group (3.10%).

Table 2: Distribution of fingerprint patterns of right index in relation to blood group

Right Index	Blood Group (%)			
	B	O	A	AB
LOOP (122)	34.40	35.20	23.00	7.40
WHORL (96)	29.20	41.70	22.90	6.20
ARCH (32)	28.10	40.60	28.10	3.10
Total (250)	31.60	38.40	23.60	6.40

P-value: 0.893

The loop pattern in the right middle finger was the highest in 'O' blood group (38.40%) and the least number in 'AB' blood group (6.80%). In the Right middle finger, the whorl fingerprint pattern was the highest in 'O' blood group (42.40%) and least seen in 'AB' blood group (3.40%), Arch was commonly seen in the 'A' blood group (35.70%) and least seen in the 'AB' blood group (14.30%).

Table 3: Distribution of fingerprint patterns of right middle in relation to blood group

Right Middle	Blood Group (%)			
	B	O	A	AB
LOOP (177)	30.50	38.40	24.30	6.80
WHORL (59)	35.60	42.40	18.60	3.40
ARCH (14) *	28.60	21.40	35.70	14.30
Total (250)	31.60	38.40	23.60	6.40

*Not included in statistical test of significance due to small sample size P-value: 0.570

In right ring finger whorls were most commonly present in the 'O' blood group (43.30%) and least in 'AB' blood group (6.70%). Loops were commonly seen in the 'B' blood group (35.60%) and least in the 'AB' blood group (6.80%). In the right ring finger arch print was most seen in the 'A' blood group (41.70%) and nil in the 'AB' blood group.

Table 4: Distribution of fingerprint patterns of right ring in relation to blood group

Right Middle	Blood Group (%)			
	B	O	A	AB
LOOP (118)	35.60	34.70	22.90	6.80
WHORL (120)	27.50	43.30	22.50	6.70
ARCH (12) *	33.30	25.00	41.70	0.00
Total (250)	31.60	38.40	23.60	6.40

*Not included in statistical test of significance due to small sample size P-value: 0.500

Table 5: Distribution of fingerprint patterns of right little in relation to blood group

Right Little	Blood Group (%)			
	B	O	A	AB
LOOP (194)	33.00	37.10	22.70	7.20
WHORL (48)	22.90	47.90	25.00	4.20
ARCH (8) *	50.00	12.50	37.50	0.00
Total (250)	31.60	38.40	23.60	6.40

*Not included in statistical test of significance due to small sample size P-value: 0.386.

DISCUSSION

In present study, the basic fingerprint patterns of the right thumb were compared with the four blood groups. Loop prints were more in 'O' blood group (36.70%) and least seen in 'AB' blood group (8.20%). Whorl was seen commonly in 'O' blood group (41.80%) and absent seen in 'AB' blood group (4.10%). Arch was seen in 'B' blood group (80.00%) and absent in 'A' and 'AB' blood groups. This finding is similar to the work done by Noor Eldin Fayrouz and associates^[8] which showed that loops (47%) were the common pattern. Similarly, the work done by Bharadwaja and colleagues in Rajasthan on 300 students^[9] also showed highest percentage of loops in the thumb of O blood group individuals, (57.8%). In present study, in the right index finger loop pattern was most commonly seen in 'O' blood group (35.20%) and least common in 'AB' blood group (7.40%). In the right index finger whorls were commonest in 'O' blood group (41.70%) and least in 'AB' blood group (6.20%). Arch was seen mostly in 'O' blood group (40.60%) and least common seen in 'AB' blood group (3.10%). Similar finding of loops being maximum in number for index finger of O blood group (44.3%) was seen in the study of Noor Eldin Faryrouz and associates. But the study of Baradwaja and colleagues showed maximum loops (35.9%) in B blood group of index fingers. In our study, the loop pattern in the right middle finger was the highest in 'O' blood group (38.40%) and the least number in 'AB' blood group (6.80%). In the Right middle finger, the whorl fingerprint pattern was the highest in 'O' blood group (42.40%) and least seen in 'AB' blood group (3.40%), Arch was commonly seen in the 'A' blood group (35.70%) and least seen in the 'AB' blood group (14.30%). Similar findings of loop being maximum in number for middle fingers of blood group O were (56.71%) seen in the study of Noor Eldin Fayouz and associates. But the study of Bardawaraj and colleagues showed maximum number of loops (64.1%) in B blood group of middle fingers. In right ring finger whorls were most commonly present in the 'O' blood group (43.30%) and least in 'AB' blood group (6.70%). Loops were commonly seen in the 'B' blood group (35.60%) and least in the 'AB' blood group (6.80%). In the right ring finger arch print was most seen in the 'A' blood group (41.70%) and nil in the 'AB' blood group. Similar findings of whorls being maximum in number for ring finger of O blood group were seen in the studies of Baradawaraj and colleagues and Noor Eldin Fayouz and associates^[10] (62.6% and 41.6% respectively) In our study, right little finger showed the highest number of loops present in 'O' blood group (47.90%) and the least in 'AB' blood group (4.20%). Whorl was the highest seen fingerprint in the 'O' blood group (47.90%) and the least seen in 'AB' blood group (4.20%). Arch pattern was the Similar findings of loops being

maximum in number for little finger of blood group O were seen in the studies of Baradawaraj and colleagues^[11] and Noor Eldin Fayouz and associates^[12] (72.6%, 61.1% respectively) highest seen in the 'B' blood group (50.60%) and nil in 'AB' blood group. For all the fingers in all blood groups, the association with fingerprint patterns was statistically insignificant (p value > 0.05). This was when each finger was compared with the fingerprint patterns in the four blood groups statistically. Similar insignificant statistical association was seen in the work done by Dennis. E.O. Eboh Delta State University, Nigeria.^[13] Kshirsagar et al (2003) reported that the distribution of fingerprint patterns in A, B, AB and O blood groups were not statistically significant. In a study carried out among Delta state University students, Abraka, Odokuma et al. (2008) also revealed that there was no significant association between thumb print patterns and ABO blood groups.

CONCLUSION

The relation of blood groups with right hand fingerprint patterns was statistically insignificant. Hence, the prediction of blood group of a person is possible to an extent based on the person's fingerprint pattern.

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