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Original Article

# Dermatoglyphics and Their Relationship With Blood Group: An Exploration

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ABSTRACT

**Introduction:** Dermatoglyphics means the study of skin markings or patterns on fingers, hands, and feet. Dermatoglyphics is a heritable trait that is considered as a usual phenotype in criminology. Dermatoglyphics acts as a scientific method for identification of an individual and it is constant till demise. **Objectives:** This study was conducted to correlate the dermatoglyphics and blood grouping of 150 dental students. **Materials and Methods:** A pro forma was prepared on a durable white paper, rubber stamp ink pads were used for smearing each finger, imprints were taken, and each pattern of fingerprint was observed by powerful hand lens and recorded. Note was made of the sex, age, and ABO and Rh blood group for studying the relationship between types of fingerprints and relation to ABO and Rh blood type. Fingerprint was taken using the INK method as illustrated by Cummins and Mildo. Fingerprint patterns (loops, whorls, and arches) and blood data were collected. **Results:** In this study, 38% of subjects belonged to O blood group followed by A, B, and AB, and 96.77% of subjects were Rh-positive and 3.23% were Rh-negative. **Conclusions:** This study shows the association between distribution of dermatoglyphics, ABO, Rh blood group, and gender.

**Keywords:** *ABO blood group, arches, dermatoglyphics, loops, Rh blood group*

## Introduction

Dermatoglyphics (fingerprint/dactylography) is derived from the Greek word "Derma = Skin, Glyphe = Carve." Dermatoglyphics is defined as the scientific study of naturally occurring epidermal ridges and their configuration on the digits, palms, and soles apart from flexion crease and secondary folds. The term dermatoglyphics was first coined by Anatomist Harold Cummins in 1926, and he found that the design of ridges on the sole and foot is gritty by heredity and accidental or environmental influence in their intrauterine life.[1] The development of dermatoglyphics initiates from 12th to 16th week of intrauterine life and accomplished by the 20th week of intrauterine life.[2] Dermatoglyphics is constant and idiosyncratic even in monozygotic twins from birth till demise. Fingerprint is the personal identification of a human being.[3,4] Fingerprint is helpful in medicolegal case for recognition of suspect, victims, and another person who touches the surface and for the diagnosis of inheritable disease. Fingerprint scans are also used in digital mission of India, biometric systems, validating electronic registration, cashless transactions, library access, and forensic purposes.[5,6] ABO blood group system was discovered at University of Vienna by Austrian Scientist Karl Landsteiner. ABO and Rh blood group systems are of major importance compared to other systems.[7] ABO is further classified into four principal types: A, B, AB, and O. There are two antigens and two antibodies responsible for ABO type. Rh

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blood group is one of the most complex blood groups in human and it is further classified into Rh-positive and Rh-negative due to the presence of absence of D antigen.[8] Various diseases usually influence particular blood group like duodenal ulcer in O and gastric ulcer in A blood group.[9,10] The aim of this study was to find correlation between ABO and Rh blood group with dermatoglyphic pattern in human beings.

## Materials and Methods

### Study population

The study was conducted among 150 dental students studying at Vivekanandha Dental College for Women, Elayampalayam, Tiruchengode, India. All the study subjects were healthy and the subjects having hand or finger deformities and blood group diseases were excluded. A pro forma was prepared on a durable white paper, rubber stamp ink pads were used for smearing each finger, imprints were taken, and each pattern of fingerprint was observed by powerful hand lens and recorded. Fingerprints were taken using the INK method as illustrated by Cummins and Mildo in 1961. The materials used for this study were Faber-Castell blue color INK pad, A4-size white paper, cardboard, gauze pads, magnifying lens, pencil, and pen. Each white paper was filled with basic details of subjects such as name, sex, age, date, blood group, and fingerprints of right and left palms.

### Methods

Each subject was asked to wash their hands and dry them with the help of a towel. After that, press each right- and left-hand fingertips separately in the stamp pad. Prints were taken on a white A4-size paper. Finally, fingerprint patterns (loops, whorls, and arches) were observed with the help of a magnifying lens, and blood group data of each subject were collected.

### Statistical analysis

The data collected were entered and analyzed using SPSS, version 20 (SPSS, IBM, IL, USA). Data were expressed as numbers and percentages, and analyzed by X2. Level of significance was set as $P$ value < 0.05. Chi-square test revealed that the relation between fingerprint and blood group is statistically significant at $P < 0.05$ ($P = 0.046$*; *indicates highly significant).

## Results

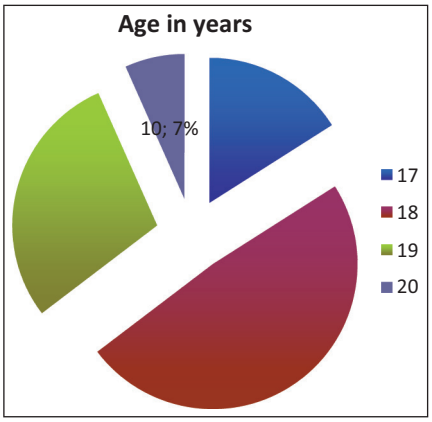
Table 1 and Graph 1 show the distribution of age in years, and it shows that the maximum percentage, i.e., 49% (73 subjects) was observed at 18 years followed by 19 years, i.e., 29% (43 subjects); 17 years, i.e., 16% (24 subjects); and 20 years, i.e., 7% (10 subjects).

Table 2 and Graph 2 show the distribution of fingertip pattern in the digits of both hands, and it shows that the maximum percentage, i.e., 40% (60 digits) was observed in loops, followed by arches, i.e., 39% (58 digits) and whorls, i.e., 32% (21 digits).

Table 3 and Graph 3 show the distribution of blood group among the subjects and it shows that the maximum percentage, i.e., 35% (53 subjects) was observed in O+, followed by B +, i.e., 33% (50 subjects); A+, i.e., 18% (27 subjects); AB+, i.e., 8% (12 subjects); O−, i.e., 3% (4 subjects); B−, i.e., 2% (3 subjects); and A−, i.e., 1% (1 subject).

**Table 1: Distribution of age in years ($n$ = 150)**

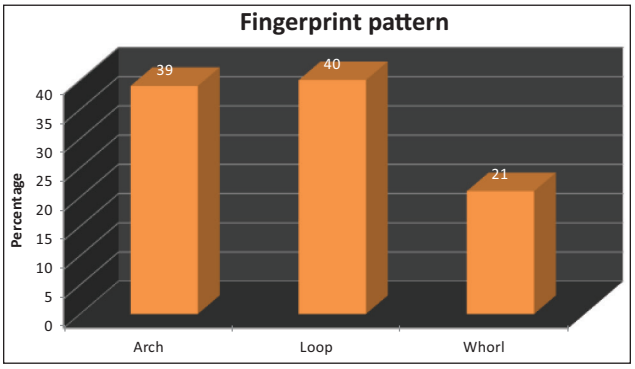
| Age in years | Frequency | Percent |
|---|---|---|
| 17 | 24 | 16 |
| 18 | 73 | 49 |
| 19 | 43 | 29 |
| 20 | 10 | 7 |
| Total | 150 | 100 |




**Graph 1:** Distribution of age in years ($n$ = 150)

**Table 2: Distribution of fingertip pattern in the digit ($n$ = 150)**

| S. no. | Fingerprint pattern | Frequency | Percent (%) |
|---|---|---|---|
| 1 | Arch | 58 | 39 |
| 2 | Loop | 60 | 40 |
| 3 | Whorl | 32 | 21 |
| Total | | 150 | 100 |




**Graph 2:** Distribution of fingertip pattern in the digit ($n$ = 150)

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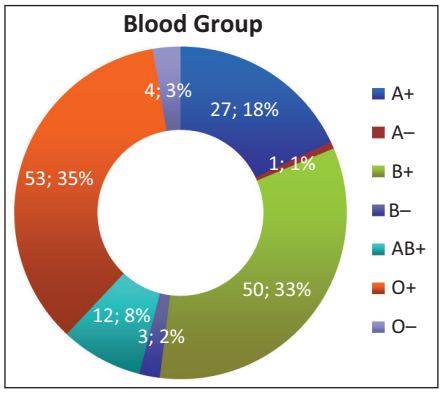


Table 4 and Graph 4 show the distribution of fingertip pattern of hand according to blood group and it shows that the incidence of whorl was maximum in A+, i.e., 44% (12 subjects); arch was maximum in A−, i.e., 100% (1 subject); arch was maximum in B+, i.e., 48% (24 subjects); all the three patterns (arch, loop, and whorl) were equally distributed in B−, i.e., 33% (3 subjects); loop was maximum in AB+, i.e., 58% (7 subjects); loop was maximum in O+, i.e., 45% (25 subjects); and arch was maximum in O−, i.e., 75% (3 subjects).

There was a significant correlation between the different fingerprint patterns and the group of the blood among 150 subjects with a *P* value of 0.046*; (*indicates highly significant).

**Table 3: Distribution of blood group among the subjects (*n* = 150)**

| Blood group | Frequency | Percent |
|---|---|---|
| A+ | 27 | 18 |
| A− | 1 | 1 |
| B+ | 50 | 33 |
| B− | 3 | 2 |
| AB+ | 12 | 8 |
| O+ | 53 | 35 |
| O− | 4 | 3 |
| Total | 150 | 100 |

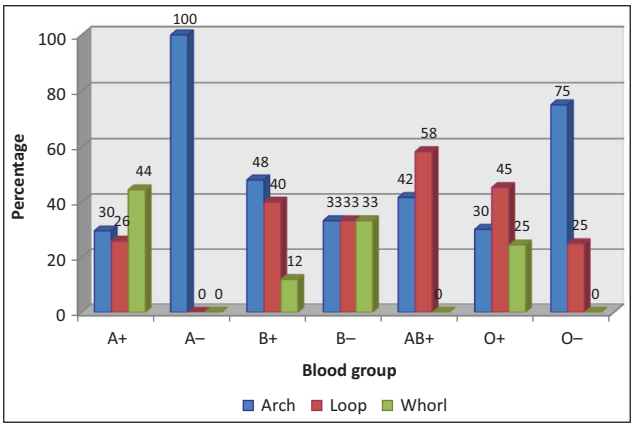



**Graph 3:** Distribution of blood group among the subjects (*n* = 150)

## Discussion

This study revealed the relation between distribution of dermatoglyphic (dactylography, fingerprint), blood group, and gender. This study was carried out on 150 subjects; maximum of the subjects belonged to O blood group, i.e., 35% (53 subjects) were O+, followed by B+, i.e., 33% (50 subjects); A+, i.e., 18% (27 subjects); AB+ i.e., 8% (12 subjects); O−, i.e., 3% (4 subjects); B−, i.e., 2% (3 subjects); and A−, i.e., 1% (1 subject).

The universal distribution of fingerprint pattern was of the order in individuals with A, B, AB, and O blood group, i.e., higher frequency for loops, moderate for whorls, and low for arches. In this study, whorl was maximum in A+, i.e., 44% (12 subjects); arch was maximum in A−, i.e., 100% (1 subject); arch was maximum in B+, i.e., 48% (24 subjects); all the three patterns (arch, loop, and whorl) were equally distributed in B−, i.e., 33% (3 subjects); loop was maximum in AB+, i.e., 58% (7 subjects); loop was maximum in O+, i.e., 45% (25 subjects); and arch was maximum in O−, i.e., 75% (3 subjects), which correlates with the studies of Singh *et al.*[11] and Mahajan,[12] and with Kshirsagar *et al.*[13] who found the highest percentage of loops in AB blood group.




**Graph 4:** Distribution of fingertip pattern of hand according to blood group (*n* = 150)

**Table 4: Distribution of fingertip pattern of hand according to blood group (*n* = 150)**

| Blood group | Fingerprint pattern | | | | | | Total | Chi square | *P* |
|---|---|---|---|---|---|---|---|---|---|
| | Arch | | Loop | | Whorl | | | | |
| | *N* | % | *N* | % | *N* | % | | | |
| A+ | 8 | 30 | 7 | 26 | 12 | 44 | 27 | 21.38 | 0.046* |
| A− | 1 | 100 | | | | | 1 | | |
| B+ | 24 | 48 | 20 | 40 | 6 | 12 | 50 | | |
| B− | 1 | 33 | 1 | 33 | 1 | 33 | 3 | | |
| AB+ | 5 | 42 | 7 | 58 | | | 12 | | |
| O+ | 16 | 30 | 24 | 45 | 13 | 25 | 53 | | |
| O− | 3 | 75 | 1 | 25 | | | 4 | | |
| Total | 58 | 39 | 60 | 40 | 32 | 21 | 150 | | |

*Significant at 5%

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In this study, there was a significant correlation between the different fingerprint patterns and the group of the blood among 150 subjects with a $P$ value of 0.046*; (*indicates highly significant $P < 0.05$), which correlates with Mehta,[7] Kshirsagar *et al.*,[13] Bharadwaj *et al.*,[14] and with Rastogi and Pillai.[15]

## Conclusion

With recent advances in fingerprint-sensing technology and improvement in the accuracy and matching speed of the fingerprint-matching algorithms, automatic personal identification is becoming attractive/complement to the traditional methods of identification. This study revealed association between dermatoglyphic pattern and blood group.

- Majority of subjects belonged to O blood group.
- Loops were frequent and whorls were uncommon in fingerprints.
- Loops were the highest in AB blood group and the lowest in A blood group.
- Arches were the highest in A blood group and the lowest in O blood group.
- Whorls were the highest in A blood group and the lowest in B blood group.

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