

## Study of Relationship between Thumbprint Patterns and ABO Blood Groups

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### Abstract

Identity is a set of physical characteristics, functional and pathological, that defines an individual. The various identification data that can be used are fingerprints, handwriting, lip marks, DNA fingerprinting, etc. The present study was carried out in 100 undergraduate medical, dental and physiotherapy students to screen thumbprint patterns of various individuals, to screen 'ABO' blood groups of the same individuals, and to study the relationship between thumbprint type and blood group. We found that B +ve type was the commonest (53%), followed by O +ve (23%), and A positive (12%) and AB positive (8%). Loop pattern was commonest with blood group B +ve (25%), whorl pattern is found most commonly in blood group B +ve followed by blood group A and AB. We may conclude that there is an association between distribution of thumbprint patterns and blood group. Determination of blood group of a person is possible based on his/her thumbprint patterns.

**Keywords:** Blood group, Relationship, Thumbprint pattern.

### Introduction

Identity is a set of physical characteristics, functional and pathological, that defines an individual. The various identification data that can be used are fingerprints, handwriting, lip marks, DNA fingerprinting, etc. Fingerprint is an impression of the curved lines of skin at the end of a finger that is left on a surface or made by pressing an inked finger onto paper. Fingerprints form the most reliable criteria for identification as they are absolutely individualistic and they do not change<sup>(1)</sup>.

The skin covering the anterior surface of human hand and sole of the human foot is different in the texture and appearance than the one which covers the rest of the body as on the palmar and plantar surface. It is continuously wrinkled with narrow minute ridges known as friction ridges<sup>(2)</sup>. Fingerprints appear for the first time on human fingers, palm, 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. The ridge patterns thus, formed during the fetal period does not change throughout the life of an individual, until destructed by decomposition of the skin after death<sup>(3-4)</sup>.

There are four types of patterns observed in fingers – loops, whorls, arches and composite. Arches are the simplest and also the rarest. The loop is the most common of all patterns. There are four whorl patterns: the plain whorl, the central pocket loop, the double loop, and the accident whorl. The term composite is used for combination of patterns that does not fit into any of the above classifications<sup>(4)</sup>.

Karl Landsteiner discovered the blood group system in the year 1901. Till now, 19 major groups have been identified with varied frequencies among the various races of human kind although only ABO and Rhesus groups are of major clinical importance. ABO system has been 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 presence or absence of D antigen<sup>(3-7)</sup>.

The present study was carried out to screen thumbprint patterns of various individuals, to screen 'ABO' blood groups of the same individuals, and to study the relationship between thumbprint type and blood group.

### Materials and Method

The present study was carried out in NKP Salve Institute of Medical Sciences and Research Centre, Nagpur, Maharashtra after obtaining permission from Institutional Ethics Committee. Thumbprints of right hand were collected from both male and female undergraduate students pursuing MBBS, BDS, and BPTH, which were classified and studied in detail regarding their types, as to whether or not they form a particular pattern by the help of various ridge patterns.

Simple ink pad was used to collect various thumbprint samples. Blood was collected from the same subjects using sterilized techniques, tested for blood groups with standard antiserum and recorded accordingly.

Strict quality control measures were maintained to avoid smudging, overlapping, partial printing or omissions of any kind. Prior informed consent was taken from each subject. Confidentiality of the subjects was maintained all through. After recording blood group against thumbprints, each individual combination was screened to look for a pattern.

**Study design:** Cross-sectional study.

**Sample size:** 100 subjects.

**Study duration:** Two months from August 2014 to September 2014.

**Inclusion criteria**

Both male and female undergraduate students of MBBS, BDS, and BPTH were included.

**Exclusion criteria**

1. Smudged prints were not included.
2. Incomplete prints were not included.

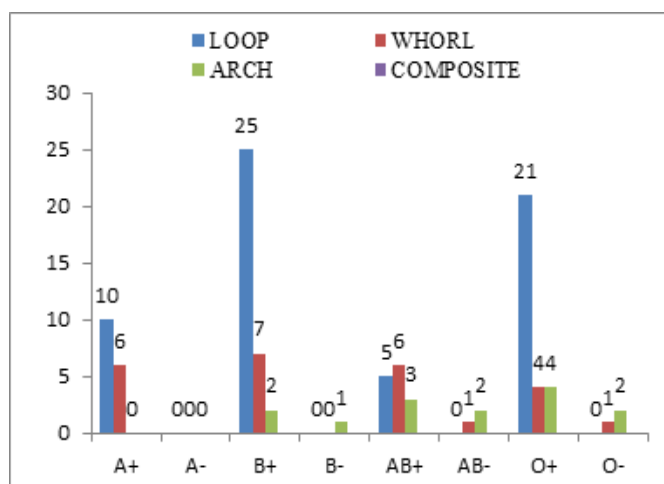
**Results**

The present study was carried out in 100 undergraduate medical, dental and physiotherapy students. The blood group distribution, as depicted in Table 1, B +ve type was the commonest (53%), followed by O +ve (23%), and A positive (12%) and AB positive (8%).

**Table 1: Blood group distribution within sample size**

Blood group	Rh factor	No. of subjects (%)
A	+ve	12 (12%)
A	-ve	0(0%)
B	+ve	53(53%)
B	-ve	2(2%)
AB	+ve	8(8%)
AB	-ve	1(1%)
O	+ve	23(23%)
O	-ve	1(1%)

Out of 100 participants of present study, loop pattern is commonest with blood group B +ve (25%) and only 5 subjects of AB blood group carried the loop pattern. Whorl pattern is found most commonly in blood group B +ve followed by blood group A and AB (Fig. 1).



**Fig. 1: Specific thumbprint pattern in each type of blood group**

**Discussion**

The purpose of classifying the fingerprints is to get back to them systematically whenever necessary. The present study is an approach to further classify thumbprint patterns. These patterns fall into two general classes called Loops and Whorls. Loops are formed by ridge lines that flow in from one side of the print, sweep up in the centre like a tented arch and then curve back around and flow out or tend to flow out on the side from where they entered. Loops are designated as being either radial or ulnar, depending on which side of the finger the lines enter. The loop is the most common of all the patterns. There are four different whorl patterns; the plain whorl, the central pocket loop, the double loop and the accidental whorl. Their common features are that they have at least two deltas and one or more of the ridge lines curves around the core to form a circle or

spiral or other rounded, constantly curving form. The accidental whorl can be any pattern or combination of patterns that does not fit into any of the above classifications. The term “composite” is used to describe such patterns.

This study was an approach to associate thumbprints and blood groups. Blood group B was predominantly found among the subjects followed by O. Distribution of thumbprints among subjects showed a high frequency of loops, moderate of whorls and none of arches.

In a study of 100 participants, 36 of which belong to B +ve blood group. Bharadwaja et al conducted a study during 2000 – 2001 on 300 medical students with different ABO blood groups in Rajasthan. 95.6% cases in the study had Rh +ve factor, of which 36% each belonged to blood group O and B<sup>(5)</sup>.

A prospective study was conducted over a period of two months among medical students of Kasturba Medical College, Mangalore. Total 200 students of age group 18- 25 years voluntarily participated in the study. Thumbprint pattern analyses showed that, loops were the most common pattern in (60.9%), followed by whorls (32.5%) while arches were present in a smaller percentage (6.5%) of the study group<sup>(6)</sup>.

Similar study done by Bhardwaja et al<sup>(5)</sup>, Rastogi Prateek et al<sup>(6)</sup> and Gowda and Rao<sup>(7)</sup> showed high frequency of loops, moderate of whorls and low of arches in blood groups A, B and O.

### Conclusion

The present study was an attempt to analyze and correlate thumbprint patterns with blood group of an individual. Although we know that fingerprints are never alike and they never change from birth till death, this study is an attempt made by us to associate thumbprints with blood group of an individual which may in turn enhance the authenticity of the fingerprints in identification and detection of criminals.

In our study, we found that loops are the commonest found thumbprint pattern, blood group B +ve was the most common, and more number of loops and whorls were found in B +ve compared to others, loops and whorls were common in O-ve as compared to other Rh -ve blood group. We may conclude that there is an association between distribution of thumbprint patterns and blood group. Determination of blood group of a person is possible based on his/her thumbprint patterns.

**Conflict of Interest: None**

**Source of Support: Nil**

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