

Original article:

A Study to find association between thumb prints and blood groups

¹Dr. Kulakrni D. G., ²Dr. Tatiya H. S. , ³Dr. Punpale S. B.

¹Associate Professor, Department of Pathology, B J Govt. Medical College and Sassoon General Hospitals, Pune

²Assistant Professor, Department of Forensic Medicine and Toxicology, B J Govt. Medical College and Sassoon General Hospitals, Pune.

³Professor, Department of Forensic Medicine and Toxicology, B J Govt. Medical College and Sassoon General Hospitals, Pune.

Corresponding author: Dr. H. S. Tatiya

Abstract:

Dermatoglyphics is study of pattern of fine ridges on fingers, palms and soles. The type of finger print is unique and is based on genetic characters of each individual. Fingerprints are classified and documented on the basis of ridge patterns. The impressions made by the pattern of any individual remain unchanged throughout life and 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. Thumb prints are the most commonly used in routine practice out of all other fingerprints. Due to their immense potential particularly in forensic medicine, the study of thumb print pattern was carried out in relation to various ABO blood groups. The present study was carried on thumb prints obtained from both the hands of 113 females and 87 males having different ABO blood groups. Results show that Loops are most commonly found fingerprint patterns and composites are least common. Loops dominated in all the Blood groups of both Rh positive and Rh negative individuals but Whorls were found to be dominating in O negative blood group. The only association between gender and finger print patterns in this study is that arches were found to be higher in males.

Key words: Identification, Thumb Print, Dermatoglyphics, ABO blood group.

Introduction:

A finger print is an impression of the friction ridges on all parts. The dermal carvings or finger prints appear for the first time on the human fingers, palm, soles and toes from 12th to 16th week of embryonic development and their formation gets completed by the 14th week i.e. about the 6th foetal month. The ridges thus, formed during the foetal period do not change their course or alignment throughout the life of an individual, until destroyed by decomposition of the skin after death ⁽¹⁾

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 ⁽²⁾. Dermatoglyphics, the study of fingerprints are

constant and individualistic. Herschel used fingerprints for personal identification in India. Galton classified the types of finger prints depending upon their primary pattern as loops, whorls and arches ⁽³⁾.

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⁽⁴⁾. 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.⁽²⁾

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⁽⁵⁾. Both thumb prints as well as blood groups are utilised by investigating agencies to find the identity of an individual. Hence in the present study we have tried to find the correlation between thumb prints and blood groups.

Objective:

1. To study the pattern of thumb prints of both hands.
2. To study the association between thumb prints, blood groups and sex.

Material and Methods:

The present study was carried out on the 200 intern students at B J Govt Medical College, Pune in the Department of Forensic Medicine and Toxicology, during the period January 2015 to June 2016. 100 students (27 male & 73 female) belonging to the age group 17-25 years of known blood groups were randomly selected for the study.

Written informed consent was taken from the study subjects. The materials used were printers, the stamp pad with blue ink (CAMLIN Company of size 157×96 mm), cardboard, roller, gauze pads & sheets of paper. Finger prints were taken after

washing the hands with soap water and after complete drying.

Finger prints were obtained for the thumbs of both hands by using the Ink Method as described by Cummins and Midlo⁶. A 15" x 6" sized plain glass was used as inking slab. The smeared thumbs of both hands were printed on a durable plain paper laid down on a pressure pad. The patterns of finger prints (loops, whorl, arches and composite) were observed with the help of hand lens. Rolled prints of right and left hand thumbs 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. Subjects with permanent scars on their thumbs, with any hand deformities due to injury, where blood group was not known, were excluded from our study.

Observation and results:-

In the present study, 200 intern students were taken, which showed female preponderance with 113 cases and 87 were males. (Table 1)

Table 2 shows that maximum 87 (43.5%) of the study subjects belong to B blood group whereas AB blood group contributes minimum 18 (9%) of the study subjects.

Table 3 shows that maximum 189 of the study subjects belong to Rh positive group, out of which 83 belonged to blood group B positive, 52 of blood group O positive, 36 of blood group A positive and 18 belonged to AB positive blood group. Total Rh negative cases in this study were 11, out of which 4 each were of blood group O & B and 3 of blood group A. There was no any student with AB negative blood group.

Table 4 shows that in Right thumb, Loops were the most common pattern with 112 (56.35 %) in followed by Whorls 72 (36.25%) & Arches 11 (5.5%) with composite as the lowest with 5 (2.5%) cases. The scenario was similar in left thumb with

Loops being the most common pattern with 102 (51%) followed by Whorls 76 (38%) & Arches 18 (9%) with composite as the lowest with 4 (2%) cases.

From Table 5 it is clear that frequency of loops was overall highest in all blood groups irrespective of their Rh positive or negative status and is followed by whorls, arches and composites. Highest frequency of loops was found in O positive individuals (58.62%). Highest frequency of whorls was found in O negative individuals (46.29%). Highest frequency of arches was found in A positive individuals (19.51%) and highest frequency of composite was found in AB positive individuals (5.55%) and least in B positive

individuals (29.26%). The least frequency of all the patterns was in AB negative individuals.

Table 6 shows the distribution of primary fingerprint patterns among the males and females. In females Loops were common, followed by whorls, arches and composite. Similarly the same pattern was observed in male subjects. Also we can find that frequency of Loops, whorls and composite were found to be higher in females with 57.01%, 58.79% and 66.66% frequencies respectively. However arches were found to be higher in males with 65.51% frequency . From Table 7 it is observed that in thumbs of both hands the loops were the most common pattern followed by the whorls, arches and composite, irrespective of the blood group.

Table 1: Sexwise distribution of cases.

| Gender | Number | Percentage |
|--------|--------|------------|
| Male | 88 | 44 |
| Female | 112 | 56 |
| Total | 200 | 100 |

Table 2: Distribution of cases according to Blood groups.

| Sr. No | Blood group | Number | Percentage |
|--------|-------------|--------|------------|
| 01 | A | 39 | 19.5 |
| 02 | B | 87 | 43.5 |
| 03 | AB | 18 | 9 |
| 04 | O | 56 | 28 |
| 05 | Total | 200 | 100 |

Table 3: Distribution of cases according to Sex and Blood groups.

| Gender | Blood Groups | | | | | | | |
|--------|--------------|------|------|------|-------|-------|------|------|
| | A+ve | A-ve | B+ve | B-ve | AB+ve | AB-ve | O+ve | O-Ve |
| Male | 21 | 1 | 31 | 2 | 06 | 00 | 24 | 3 |
| Female | 16 | 2 | 52 | 2 | 12 | 00 | 28 | 1 |
| Total | 37 | 3 | 83 | 4 | 18 | 00 | 52 | 4 |

Table 4: General distribution of primary finger print patterns in thumbs of both hands.

| Sr. No | Fingerprint Pattern | Right Thumb | Percentage | Left thumb | Percentage |
|--------|---------------------|-------------|------------|------------|------------|
| 01 | Loops | 112 | 56.35 | 102 | 51 |
| 02 | Whorls | 72 | 36.25 | 76 | 38 |
| 03 | Arches | 11 | 5.5 | 18 | 9 |
| 04 | Composite | 05 | 2.5 | 04 | 2 |
| 05 | Total | 200 | 100 | 200 | 100 |

Table 5: General distribution of primary finger print with respect to ABO and Rh blood grouping patterns of both thumbs.

| Fingerprint pattern | Blood Gropus | | | | | | | | Total |
|---------------------|----------------|--------------------|----------------|--------------------|--------------------|-----|----------------|----------------|-------|
| | A | | B | | AB | | O | | |
| | +ve | -ve | +ve | -ve | +ve | -ve | +ve | -ve | |
| Loops | 19 (46.34%) | 18 (48.64 %) | 51 (56.04%) | 48 (57.83 %) | 18 (50%) | 0 | 34 (58.62%) | 26 (48.14%) | 214 |
| Whorls | 12 (29.26%) | 11 (29.72 %) | 36 (39.56%) | 32 (38.55 %) | 12 (33.33 %) | 0 | 20 (34.48%) | 25 (46.29%) | 148 |
| Arches | 08 (19.51%) | 07 (17.03 %) | 03 (3.2%) | 02 (2.4%) | 04 (11.11 %) | 0 | 03 (5.12%) | 02 (3.7%) | 29 |
| Composite | 02 (4.89%) | 01 (2.4%) | 01 (1.1%) | 01 (1.2%) | 02 (5.55%) | 0 | 01 (1.72%) | 01 (1.8%) | 9 |
| Total | 41 | 37 | 91 | 83 | 36 | 0 | 58 | 54 | 400 |

Table 6: Sexwise distribution of primary finger print patterns in thumbs of both hands.

| Sr. No | Fingerprint Pattern | Male (88) | Female (112) | Total |
|--------|---------------------|-------------|--------------|-------|
| 01 | Loops | 92 (42.99%) | 122 (57.01%) | 214 |
| 02 | Whorls | 61 (41.21%) | 87 (58.79%) | 148 |
| 03 | Arches | 19 (65.51%) | 10 (34.49%) | 29 |
| 04 | Composite | 03 (33.33%) | 06 (66.67%) | 09 |
| 05 | Total | 166 | 224 | 400 |

Table 7: Distribution of finger print patterns in thumbs of both Right and left hand.

| Finger | Blood Groups | | | | | | | | | | | | | | | |
|-------------|--------------|----|----|----|--------|----|----|----|---------|----|----|----|--------|----|----|----|
| | A (39) | | | | B (87) | | | | AB (18) | | | | O (56) | | | |
| | L | W | A | C | L | W | A | C | L | W | A | C | L | W | A | C |
| Right thumb | 19 | 14 | 04 | 02 | 51 | 32 | 03 | 01 | 10 | 06 | 01 | 01 | 32 | 20 | 03 | 01 |
| Left Thumb | 18 | 09 | 11 | 01 | 48 | 36 | 02 | 01 | 08 | 06 | 03 | 01 | 28 | 25 | 02 | 01 |

Discussion:

The present study reveals that there was an association between distributions of fingerprint (dermatoglyphic) pattern and blood groups. We found that maximum 87 (43.5%) of the study subjects belong to B blood group whereas AB blood group contributes minimum 18 (9%) of the study subjects when both the sexes were considered together. These findings are consistent with those observed by Bhavana Desai et al ⁽¹⁾, Radhika R H ⁽²⁾, Usha verma et al ⁽³⁾ and Mehta et al ⁽⁷⁾, whereas Bharadwaja et al ⁽⁸⁾ found that majority of the cases belonged to O blood group and minority to AB blood group.

In the present study, we have observed that maximum 189 of the study subjects belong to Rh positive group. Our findings match with those of Radhika R H ⁽²⁾, Usha verma et al ⁽³⁾ and Bharadwaja et al ⁽⁸⁾.

The general distribution pattern of the primary finger print was of the same order in individuals with A, B, AB and O blood group i.e. high frequency of loops, moderate of whorls followed by arches and composites. The same findings were seen in Rh-positive and Rh- negative individuals of ABO blood group. This finding is consistent with the work of previous researchers.^(2,3, 7-9)

In this study we also have observed that frequency of loops, arches and composites were highest in Rh positive individuals as compared to Rh negative individuals, however whorls were more marked in

O negative individuals as compared to blood group O positive. This is in accordance with the study conducted by Usha verma et al ⁽³⁾ and Bharadwaja et al ⁽⁸⁾. Bhardwaj et al ⁽⁸⁾ found this observation in AB negative individuals.

The current study shows that in females Loops were common, followed by whorls, arches and composite. Similarly the same pattern was observed in male subjects. Also we can find that frequency of Loops, whorls and composite were found to be higher in females with 57.01%, 58.79% and 66.66% frequencies respectively. However arches were found to be higher in males with 65.51% frequency. The study done by Bhavana Desai et al ⁽¹⁾ however shows that frequency of Loops were found to be higher in females; 620(52.63%) and Whorls were found to be higher in males; 338(57.09%). Arches were found more in females; 119(51.73%) compared to males; 111(48.26%).

In this study we found that thumbs of both the hands showed the fingerprint pattern of loops, whorls, arches and composite in decreasing order of frequency irrespective of blood group. However the study done by Usha Verma et al ⁽³⁾ has showed in right hand, the thumb, index, middle and little fingers of A and B blood group individuals showed high frequency of loops. Whorls were more in ring fingers of all blood groups. Individuals of AB blood group also presented more whorls in their thumbs, whereas; their index, middle and little

fingers have more loops. Individuals of O blood group also presented more whorls in their thumbs and index fingers, whereas; their middle and little fingers have more loops. Frequency of arches were least in majority of cases but index, middle and ring fingers of blood group A and O and index finger of blood group B individuals showed comparatively high frequency. In left hand, all the fingers of A and B blood group showed high frequency of loops. Individuals of AB blood group also presented more loops in their thumbs, middle and little fingers, whereas; their index and ring fingers have more whorls. Individuals of O blood group also presented more loops in their index, middle and little fingers whereas; their ring finger has more whorls and their thumb has equal number of loops and whorls. Frequency of arches were least in majority of cases but index and middle fingers of blood group B and O, ring finger of blood group O and index finger of blood group A individuals showed comparatively high frequency.

Bharadwaja et al ⁽⁸⁾ described the distribution of different finger prints in different fingers of both hands in common. They found that the distribution pattern in individual fingers had high frequency of loops in thumb and little finger whereas ring fingers had more whorls and index and middle fingers presented higher incidences of arches in subjects of A, B and O blood groups. Individuals of blood group AB had high frequency of whorl in thumb, index and ring fingers while middle and little fingers showed more number of loops.

Conclusion:

From the above study it can be concluded that there is a definite association between distribution of fingerprint patterns of thumbs, blood group and gender. Thus one can predict the blood group and gender of an individual from his/her fingerprint pattern, which may in turn enhance the authenticity of the fingerprints in identification and detection of criminals.

References:

1. Desai Bhavana, Jaiswal Ruchi, Tiwari Prakash, Kalyan J.L. Study of Fingerprint Patterns in Relationship with Blood group and Gender – A Statistical Review. Res. J. Forensic Sci. 2013; 1(1): 15-17.
2. Radhika.R. H. Pattern of fingerprints and their relation with blood groups. Indian Journal of Basic and Applied Medical Research. March 2016; 5 (2): 744-749. P ISSN: 2250-284X , E ISSN : 2250-2858
3. Verma Usha, Singroha Ritu, Malik Preeti. A study to find correlation between dermatoglyphic patterns and abo blood groups. Int J Anat Res. 2015; 3(3):1293-97. ISSN 2321-4287 1297.
4. Vij K. Textbook of Forensic Medicine and Toxicology.3rd Ed. New Delhi: Elsevier, 2005: 89-91.
5. Bijlani R.L., Textbook of Physiology, 2nd ed. Blood Groups, 93 – 94.
6. Cummins H. Palmar and Plantar Epidermal Ridge Configuration (Dermatoglyphics) in Europeans and Americans. Am.J. Phy. Anthropol. 1926; 179: 741-802.
7. Mehta AA, Mehta AA, Sonar V. Digital Dermatoglyphics in ABO, Rh blood groups. JIAFM. 2011; 33(4):349-51.
8. Bharadwaja A, Saraswat PK, Agrawal SK, Banerji P,Bharadwaj S. Pattern of fingerprints in different ABO blood groups. J Forensic Med Tox. 2004; 21(2): 49–52.
9. Shashikala L, Ashwini J. Digital Dermatoglyphics and ABO blood groups. Int J Forensic Med and Path. 2011; 4(2) :77-81.