

A STUDY TO FIND CORRELATION BETWEEN DERMATOGLYPHIC PATTERNS AND ABO BLOOD GROUPS

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ABSTRACT

Background: Dermatoglyphics, the study of fingerprints are constant and individualistic. It has been found useful in forensic medicine and identification purpose. It is useful in medical diagnosis of genetically inherited diseases and in detection of crimes.

Objectives: The present study was conducted to correlate between digital dermatoglyphics patterns in ABO, Rh blood groups and to evaluate their significance.

Methods: A total of 200 first year MBBS students of Pt. B.D. Sharma PGIMS, Rohtak, India, with known blood groups from age group 17-22 yrs were included in the study. Fingerprints were obtained by Ink method. Parameters studied were arches, whorls, loops.

Results: Majority of the subjects (43.5%) in the study were of blood group A followed by blood group O, A and AB of whom 94.5% were Rh-positive. The general distribution of pattern of finger print showed high frequency (51.87%) of loops followed by whorls and arches. Almost same order was noticed in both Rh-positive and Rh-negative individuals or A, B, AB and O blood groups, except blood group O-ve which showed more whorls.

Conclusion: There is an association between distribution of finger print pattern and blood groups.

KEY WORDS: Dermatoglyphics, Loops, Whorls, Arches.

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INTRODUCTION

The term dermatoglyphics has its origin from Greek word 'derma' means skin and 'glyphics' means curved. Dermatoglyphics deals with study of the epidermal ridges and their configuration on the volar aspect of fingers, palms and soles. 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 fetal life [1].

Cummins coined the term dermatoglyphics. He found that the configurations of ridge pattern are determined partly by heredity and partly by accidental or environmental influence, which produce stress and tension in their growth during foetal life [2].

Dermatoglyphics, the study of fingerprints are constant and individualistic [3]. Herschel used fingerprints for personal identification in India[4]

Galton classified the types of finger prints depending upon their primary pattern as loops, whorl and arches [5].

The major advantages of dermatoglyphics are:

1. The epidermal ridges of palm fingers are fully developed at birth & thereafter remain unchanged for life.

2. Scanning or recording of permanent impression (prints) can be accomplished rapidly, inexpensively & without causing any trauma to the patients.

During the past century, it has been apparent that different population reveals wide variation in frequency of papillary patterns on the finger ball and also wide variation in blood groups. Blotterogel expressed a correlation between physical characters and blood groups [6]. Keeping all this in mind, the present study was planned to study the correlation between ABO, Rh blood groups and dermatoglyphics patterns in North Indian population.

MATERIALS AND METHODS

The present study was carried out in the Department of Anatomy at Pt. B.D. Sharma PGIMS, Rohtak, India. 200 medical students were randomly selected for study, out of which 113 were females and 87 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. Finger prints were obtained for all the five digits of both hands by using the Ink Method as described by Cummins and Midlo (1961).

The materials used were printers, duplicating ink from Kores, cardboard, roller, gauze pads & sheets of paper.

Methods:

To enhance the quality of dermatoglyphics prints, it was essential to remove sweat, oil & dust from the skin surface. This was done by cleaning the hands with soap & water & wiping with ethyl alcohol. The print was obtained on the bond paper which was fixed with adhesive tape. The printed sheets were coded with name, age, sex and blood groups. Primary patterns (loops, whorl and arches) were observed with the help of a powerful hand lens.

OBSERVATIONS

In the present study, 200 students were taken, out of which 113 were females and 87 were males.

Table 1: Distribution of cases according to Blood groups.

Gender	Blood groups				Total
	A	B	AB	O	
Males	22 (11%)	33 (16.5%)	06 (3%)	26 (13%)	87 (43.5%)
Females	17 (8.5%)	54 (27%)	12 (6%)	30 (15%)	113 (56.5%)
Total	39 (19.5%)	87 (43.5%)	18 (9%)	56 (28%)	200 (100%)

Table 1 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 2: Distribution of cases according to Rh Blood groups.

Blood Group	Rh positive	Rh negative
A	36 (18%)	3 (1.5%)
B	83 (41.5%)	4 (2%)
AB	18 (9%)	0 (0%)
O	52 (26%)	4 (2%)
Total	189 (94.5%)	11 (5.5%)

Table 2 shows that maximum 189 (94.5%) of the study subjects belong to Rh positive group, out of which 83 (41.5%) belonged to blood group B, 52 (26%) of blood group O, 36 (18%) of blood group A and 18 (9%) belonged to AB positive blood group. Total Rh negative cases in this study were 11 (5.5%), out of which 4 (2%) each were of blood group O & B and 3 (1.5%) of blood group A.

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

Patterns of finger print	Total	Percentage
Loops	1127	56.35%
Whorls	725	36.25%
Arches	148	7.40%
Total	2000	100%

Table 3 shows that Loops were the most common pattern 1127 (56.35%) followed by Whorls 725 (36.25%) & Arches 148 (7.4%).

Frequency of loops was highest in both the Rh-positive and Rh-negative subjects of ABO blood groups; followed by whorls and arches except, blood group O where the incidence of whorls was more in Rh-negative subjects (52.5%). Incidence of loops varied between 0% (in 'AB' negatives) to 66.67% (in 'A' negatives) among

the subjects of different blood groups of whom, blood group A showed highest loops (Rh +ve 65%, and Rh -ve 66.67%). Whorls showed moderate frequency followed by arches ranging between 0% (in 'AB' negatives) to 52.5% (in 'O' negatives) and 0% (in 'A' negatives & 'AB' negatives) to 20% (in 'O' negatives) respectively (Table 4).

Table 4: Distribution of finger print patterns among subjects of A,B,O & Rh Blood groups (n=2000).

Finger print 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	234 65%	20 66.67%	487 58.67%	24 60%	99 55%	0 0%	252 48.46%	11 27.5%	1127 56.35%
Whorls	87 24.17%	10 33.33%	293 35.3%	14 35%	79 43.89%	0 0%	221 42.5%	21 52.5%	725 36.25%
Arches	39 10.83%	0 0%	50 6.02%	2 5%	2 1.11%	0 0%	47 9.04%	8 20%	148 7.4%
Total	360	30	830	40	180	0	520	40	2000

Table 5: Distribution of finger print patterns in different fingers of Right hand of subjects (n=200).

Individual Finger	Blood groups											
	A (n=39)			B (n= 87)			AB (n= 18)			O (n=56)		
	L	W	A	L	W	A	L	W	A	L	W	A
Thumb (t)	21 53.85%	15 38.46%	3 7.69%	48 55.17%	37 42.53%	2 2.3%	8 44.44%	10 55.56%	0 0%	24 42.86%	32 57.14%	0 0%
Index (i)	23 58.97%	8 20.51%	8 20.51%	38 43.68%	34 39.1%	15 17.24%	9 50%	8 44.44%	1 5.56%	23 41.07%	24 42.86%	9 16.07%
Middle (m)	31 79.45%	4 10.26%	4 10.26%	57 65.52%	25 28.74%	5 5.75%	12 66.67%	6 33.33%	0 0%	29 51.78%	17 30.36%	10 17.86%
Ring (r)	17 43.59%	18 46.15%	4 10.26%	36 41.38%	49 56.32%	2 2.3%	5 27.78%	13 72.22%	0 0%	14 25%	34 60.71%	8 14.28%
Little (l)	26 66.67%	11 28.2%	2 5.13%	65 74.71%	21 24.14%	1 1.15%	15 83.33%	3 16.67%	0 0%	33 58.93%	22 39.28%	1 1.78%

(L= loops, W= whorls and A= arches)

In right hand, the thumb, index, middle and little fingers of A and B blood group showed high frequency of loops i.e. Blood group A (t-53.85%, i-58.97%, m-79.45% and l-66.67%) and blood group B (t-55.17%, i-43.68%, m-65.52% and l-74.71%). Whorls were more in ring fingers (blood group 'A' 46.15%, 'B' 56.32%, 'AB' 72.22% and 'O' 60.71 %). Individuals of AB blood group also presented more whorls in their thumbs (55.56%), whereas; their index, middle and little fingers have more loops (i-50%, m-66.67% and l-83.33%). Individuals of O blood group also presented more whorls in their thumbs (57.14%) and index fingers (42.86%), whereas; their middle and little fingers have more loops (m-51.78% and l-58.93%). Frequency of arches were least (less than -10%) 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. (Table No. 5)

In left hand, all the fingers of A and B blood group showed high frequency of loops i.e. Blood group A (t-74.36%, i-58.97%, m-87.18%, r-56.41% and l-71.79%) and blood group B (t-67.82%, i-47.13%, m-65.52%, r-54.02% and l-72.41%). Individuals of AB blood group also presented more loops in their thumbs (61.11%), middle (66.67%) and little fingers (77.78%), whereas; their index and ring fingers have more whorls (i-50% and r-72.22%). Individuals of O blood group also presented more loops in their index, middle and little fingers (i-46.43%, m-51.78% and l-69.64%) whereas; their ring finger has more whorls (57.14%) and their thumb has equal number of loops and whorls (L-50% and W-50%). Frequency of arches were least (less than -10%) 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. (Table No. 6)

Table 6: Distribution of finger print patterns in different fingers of Left hand of subjects (n=200).

Individual Finger	Blood groups											
	A (n=39)			B (n= 87)			AB (n= 18)			O (n=56)		
	L	W	A	L	W	A	L	W	A	L	W	A
Thumb (t)	29 74.36%	8 20.51%	2 5.13%	59 67.82%	28 32.18%	0 0%	11 61.11%	7 38.89%	0 0%	28 50%	28 50%	0 0%
Index (i)	23 58.97%	8 20.51%	8 20.51%	41 47.13%	35 40.23%	11 12.64%	8 44.44%	9 50%	1 5.56%	26 46.43%	23 41.07%	7 12.5%
Middle (m)	34 87.18%	2 5.13%	3 7.69%	57 65.52%	21 24.14%	9 10.34%	12 66.67%	6 33.33%	0 0%	29 51.78%	14 25%	13 23.21%
Ring (r)	22 56.41%	14 35.9%	3 7.69%	47 54.02%	35 40.23%	5 5.75%	5 27.78%	13 72.22%	0 0%	18 32.14%	32 57.14%	6 10.71%
Little (l)	28 71.79%	9 23.08%	2 5.13%	63 72.41%	22 25.29%	2 2.3%	14 77.78%	4 22.22%	0 0%	39 69.64%	16 28.57%	1 1.78%

(L= loops, W= whorls and A= arches)

DISCUSSION

The present study reveals that there was an association between distribution of fingerprint (dermatoglyphic) pattern and blood groups.

Sex and Blood Group: In the present study, we found that in both sexes, 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. These findings are consistent with those observed by Mehta et al [8], whereas Bharadwaja et al [7] found that majority of the cases (38.33%) belonged to O blood group and minority (8.33%) to AB blood group.

Rh Blood Group: In the present study, we observed that maximum 189 (94.5%) of the study subjects belong to Rh positive group. Our findings match with those of Bharadwaja et al [7].

Type of Finger Print: 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 and low of arches. The same findings were seen in Rh-positive and Rh-negative individuals of ABO blood group [7,8,9].

Pattern of Finger Prints in different Blood Groups: In the present study, we observed that frequency of loops was highest in both the Rh-positive and Rh-negative subjects of ABO blood groups; followed by whorls and arches except, blood group O where the incidence of whorls was more in Rh-negative subjects. This is in

accordance with the study conducted by Bharadwaja et al [7] except that they found incidences of whorls more than loops in blood group AB-ve subjects.

Pattern of Finger Prints in different Fingers of both hands: In right hand, the thumb, index, middle and little fingers of A and B blood group 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.

None of the previous studies had emphasized on the distribution of different finger prints in different fingers of right and left hands separately, though Bharadwaja et al⁷ 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

There is an association between distribution of finger print pattern and blood groups. In all blood groups, the frequency of finger print pattern observed is loops were highest followed by whorls and arches respectively. In right hand, whorls were more in thumbs of AB and O blood groups, index fingers of O blood group and ring fingers of all blood groups. In left hand, whorls were more in index fingers of AB blood group and ring fingers of AB and O blood groups. So prediction of blood group to some extent may be possible with the study of finger print pattern which may be of great value in forensic medicine, but influence regional variations, gender and genetic factors should not be overlooked.

Conflicts of Interests: None

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