Dermatoglyphics in relation to gender and blood groups among the students of NIMS university, Jaipur, Rajasthan

Monika Rathee	M. Sc. Medical Anatomy, Student, Department of Anatomy, NIMS Medical College, NIMS University, Jaipur, Rajasthan.
Kavita Dhidharia	M. Sc. Medical Anatomy, Student, Department of Anatomy, NIMS Medical College, NIMS University, Jaipur, Rajasthan.
Akansha Rana	M. Sc. Medical Microbiology, Student, Department of Microbiology, NIMS Medical College, NIMS University, Jaipur, Rajasthan.

ABSTRACT   *Fingerprint evidence is considered the most reliable and acceptable evidence till date in the court of law. These remain unchanged throughout life of an individual.The fingerprints were divided into loops, whorls and arches.The present work has been done to analyze their correlation with gender and blood group of an individual.In this study, 150 subjects participated among which 75 were males and 75 were females having different ABO blood groups. The dominant ABO blood group in the population was group 'B' and Rh +ve was the dominant Rhesus factor. The fingerprint pattern of loops had the highest frequencyand arches were the least. Males have a higher incidence of whorls and females have a higher incidence of loops and arches. Thus prediction of gender and blood group of a person is possible based on his fingerprint pattern.*

KEYWORDS : Fingerprint, Blood group, Gender, Pattern.

INTRODUCTION

Human identification is the recognition of an individual based on some physical characteristics special to the individual. It is necessary for personal, social and legal reasons. Some methods of personal identification include anthropometry, DNA fingerprinting, post-mortem reports, sex determination, dactyloscopy , estimation of age, measurement of height, differentiation by blood groups, hand writing, lip prints, fingerprints and bite marks. Two person having identical fingerprints is about one in 64 thousand millions. 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. Encarta, (2009) stated that it has a unique characteristic, mark or pattern that can be used to identify somebody or something related to that particular individual.

Cummins H., (1926) described dermatoglyphics as the study of fingerprints.Cummins and Kennedy, (1940) have posited that characteristic epidermal ridge pattern are formed during the third or fourth month of the fetal life. Vij K., (2005) stated that pattern remains unchanged throughout life except for increase in size in parallel with the general growth. Holt S.B., (1968) and Verbov J., (1970) mentioned that in early pregnancy, an intrauterine growth disturbance affecting the extremities whether due to hereditary or environment factors will cause abnormal dermatoglyphics.

Herschel used fingerprints for identification in India. Cummins H., (1926) has posited that the combined effect of heredity and environment determine the pattern of ridges.

Galton, (1892) classified finger print patterns into following three patterns:

1. Loops
2. Whorls
3. Arches

These patterns are helpful in the diagnosis of genetic disorders as well as in forensic medico legal cases for personal identification. Blood grouping is also one of the most reliable traditional identification methods. Correlating finger prints with blood groups and gender may be useful in forensic science in accurate identification of an individual than by using finger prints alone. Present study is an attempt to correlate these parameters.

Material and methods

This study was carried out in the department of Anatomy at NIMS Medical College, Jaipur, Rajasthan. 150 students (75 male and 75 female) with age range of 17-21 years were randomly selected.Prior to data collection, the subjects were informed of the nature and purpose of the study and only those who gave voluntary consent, participated in the study.Students with permanent scars on their fingers or thumbs, with any hand deformities due to injury, birth defect or disease, those having worn fingerprints, extra webbed or bandaged fingers were excluded from the study.

Materials used wereself-inking pad, plain white paper and magnifying lens. For taking dermatoglyphics, Ink Method suggested by Cummins was used. Fingerprints of all ten fingers were recorded in a rolling pattern over plain white paper by using ink. Hands were thoroughly washed with soap before taking prints. Each finger was placed on the stamp pad and then transferred to theplain white paper and rolled gently from side to side to obtain clear complete print. The right hand moved clockwise and the left hand moved counterclockwise. The ABO and Rhesus blood groups of each subject were obtained from the records in the medical laboratory register. Sex and age of the subjects were also recorded.

Results

In this study, 150 subjects participated, in which 50% were males and 50% were females. Results showed that dominant ABO blood group in the population was group 'B' (40.66%), followed by group 'O' (33.33%), group 'A' (17.33%) and then group 'AB' (8.67%).Results also showed that Rh +ve was the dominant Rhesus factor (92%). When ABO-Rh blood group was considered, the prevalence was in following order: (showed in table 1.)

'B +ve' (40%), 'O +ve' (27.33%), 'A +ve' (16.67%), 'AB +ve' (8%), 'O -ve' (6%), 'A -ve, B –ve, AB -ve' (0.67%).

The general distribution of primary finger ridge patterns showed that the dominant finger ridge pattern was loop (65.8%), followed by whorl (27.4%) and then arches (6.8%). (Table 2)

Frequency of loops was highest in both Rh +ve and Rh –ve subjects of ABO blood groups, followed by whorls and arches. Among the subjects of different blood groups, the blood group 'A' showed highest loops ('A' +ve 68%) followed by whorls in blood group 'O' (32.6%). The blood group 'AB' showed highest arches ('AB'-ve 20%). (Table 3)

Loops were more in thumb and middle fingers in case of females while in males loops were more in index, ring and little fingers. The females had more whorls in ring and little fingers while the males had more whorls in thumb, index and middle fingers .Arches were more in number in all fingers of females as compared to males except in ring finger which had more arches in males (Table 4).

Table 1. Distribution of cases according to Rhesus Blood Groups

Blood groups	Rh –ve	Rh +ve
A	1 (0.67%)	25 (16.67%)
B	1 (0.67%)	60 (40.0%)
AB	1 (0.67%)	12 (8.0%)
O	9 (6.0%)	41 (27.33%)
Total	12 (8.0%)	138 (92.0%)

Table 2. General distribution of primary fingerprint patterns in all fingers of both hands

Pattern of finger prints	Total	Percentage
Loops	987	65.8%
Whorls	411	27.4%
Arches	102	6.8%
Total	1500	100%

Table 3. Distribution of fingerprint patterns among subject of A, B, AB & O and Rh blood groups

Pattern Type of finger prints	A +ve	A -ve	B +ve	B -ve	AB +ve	AB -ve	O +ve	O -ve
Whorls	62 (24.8%)	0	156 (26%)	0	35 (29.1%)	2 (20%)	134 (32.6%)	22 (24.4%)
Loops	170 (68%)	10 (100%)	394 (65.6%)	10 (100%)	76 (63.3%)	6 (60%)	257 (62.8%)	64 (71.1%)
Arches	18 (7.2%)	0	50 (8.3%)	0	9 (7.5%)	2 (20%)	19 (4.6%)	4 (4.4%)
Total	250 (100%)	10 (100%)	600 (100%)	10 (100%)	120 (100%)	10 (100%)	410 (100%)	90 (100%)

Table 4. Distribution of pattern of finger print in different fingers of both hands of subjects   (L=Loop, W=whorls, A=arches)

Individual Fingers	LOOPS			WHORLS			ARCHES		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Thumb (t)	101	109	210	44	33	77	5	8	13
Index (i)	85	82	167	45	40	85	20	28	48
Middle (m)	105	110	215	32	26	58	13	14	27
Ring (r)	78	76	164	67	72	139	5	2	7
Little (l)	123	118	241	25	27	52	2	5	7
Total	492	495	987	213	198	411	45	57	102

Discussion and Conclusion

The present study reveals that there is an association between distributions of fingerprint (dermatoglyphic) patterns, gender and blood groups. In a related study, Bharadwaja et al., (2004) reported a significant association between fingerprint patterns and blood groups. Also, Mehta and Mehta (2011) reported that there was an association between distribution of fingerprint pattern and blood groups.

In present study the general distribution pattern of fingerprints, showed high frequency of loops (65.8%), moderate whorls (27.4%), and low frequency of arches (6.8%), which are in accordance with the study done by Bhardwaja and Saraswat (2001), Ekanem et al., M. Abbasi and Mengal (2012), A. Koneru and Hunasgi (2010) and Raloti and Shah (2013).

The general distribution pattern of the primary fingerprints was of same order in individuals with 'A', 'B', 'AB' and 'O' blood groups similar to study done by Bhardwaja et al., (2004), Prateek (2010) and Gowda and Rao (1996), there is high frequency of loops, moderate of whorls and low of arches. The same findings were seen in the general distribution of the primary fingerprint patterns for Rhesus positive and Rhesus negative individuals: loops had the highest percentage, followed by whorls and the least was arches.

In present study, percentage of loops was highest in A blood group (A+ve: 68%, A –Ve: 100%) and lowest in AB blood group (AB+Ve: 63.3%, AB –Ve: 60%) which correlates with the finding of Bharadwaja et al., (2004) of having lowest percentage in AB blood group. The distribution of loops was almost same in males and females. Whorls were more in males while arches were more in females.

The findings of the study can be concluded as follows:
1. Each fingerprint is unique hence it can be very effectively used as an evidence for identification in the court of law.
2. Loops are the most commonly occurring finger-print pattern and Arches are the least common.
3. Loops are predominant in blood group A, B, AB and O in both Rh positive and Rh negative individuals.
4. Whorls are more common in blood group O positive.
5. Loops are maximum seen in blood group A while arches are more common in blood group AB.
6. Blood group B was found to be the most common among males, blood group O was the most   commonly seen blood group in females.
7. Males have a higher incidence of whorls and females have a higher incidence of loops and arches.

Thus prediction of gender and blood group of a person is possible based on his fingerprint pattern. Similar studies should be conducted on a larger sample so as to increase the accuracy of prediction.

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