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Fingerprint Patterns on Thumb in Relationship with Gender and Blood Group: A Pilot Study on North Indian Population

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Abstract

Fingerprints dactylography is the study of ridge patterns on the fingers. Dermatoglyphic is considered as the best tool for personal identification. It is one of the oldest and most reliable methods of identification. The present study was conducted to correlate between digital fingerprintpatterns with respect to ABO blood grouping system and to evaluate their significance in the field of forensic science. This study was carried on the fingerprints of about 230 subjects (122 malesand 108females) belonging to the age group 18-35 were taken from Haryana, north India. In this study Rh-negative was found 6.08% of the total population. The majority of the subjects in this population belongs to blood group O (40%) followed by B (35.2%), A (15.2%) and AB (9.56%).Loop pattern was found in highest frequency in both right and left thumb fingerprint patterns which was 50.2% followed by whorls 47.6% and Arches 2.17% predominant.In male blood group O and whorl pattern was predominant but in female blood group O was found in highest frequency. Fingerprint pattern on both Right and left thumbs showed significant differences among males and females of North Indian population.

Keywords: Dermatoglyphic; Pattern types; Fingerprints; Identification;Blood groups.

Introduction

Dermatoglyphics is the study of pattern of fine ridges on fingers, palms and soles.[1] The impression or reproductions left on any article by the friction of the ridges present on the first phalange of fingers are called as fingerprints.These graphical representations of the ridge patterns get started to appear on the human fingers, palms, soles and toes from twelfth to sixteenth week of embryonic development and their formation gets completed by the sixth fetal month.[2] Fingerprint has unique characteristic patterns and used for personal identification.[3] The patterns of these papillary ridges or fingerprints remain unchanged in an individual throughout life from birth till death.[4] Fingerprint is the best technique for personal identification because the chances of having identical fingerprints is about one in sixty-four thousand million population of the world.[5] Monozygotic twins can share the same DNA profile but having different fingerprints.[6] Accordingly, fingerprint is the best technique in the identification off any individual. Collected fingerprints from crime scene can be used to identify suspects, victims and other persons. Galtonclassified the types of finger prints dependingupontheir primary pattern as loops, whorl and arches.[7]

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Karl Landsteiner discovered the ABO blood group system in the year 1901. ABO system has been further classified as A, B AB and O bloodgroup types according to presence of corresponding antigen in plasma. Rhesus system is classified into Rh+ve and Rh-ve according to agglutination in D antigen.[8]

Fingerprints consideredas an effective method of identification an attempt has been made in the present work to analyze their correlation with gender and blood group of an individual. So that we can predict the blood group and gender with the study of fingerprint pattern which may turn in enhance the authenticity of the fingerprints in identification and detection of criminals.

Materials and Methodology

The study was conducted on 230 subjects in Haryana region in the age group of 18-35 having ABO blood groups. Students with permanent scars on their fingers or thumbs or with any hand deformities due to injury, birth defect or disease, those having worn finger-prints, extra, webbed or bandaged fingers, were all excluded from the study. Finger prints were obtained for all the fivedigits of both hands by using the Ink Method as described by Cummins and Midlo.[1] In this study only thumb prints were analyzed and other fingerprints were preserved for further future analyzes.

The procedure was clearly explained to each subject and their willful consent was taken on the fingerprint slip. Each subject was asked to clean his/her hands before taking the fingerprints. Special care was taken to avoid smudging of the print. The subject was asked to press the fingertips on the ink slab and then on to the fingerprint slip to transfer the finger print impressions on the slip. A rolled fingerprint from radial to ulnar border (from inwards to outwards) was obtained on performa with normal pressure. Performa contains other details of subject such as name, age, gender, region and blood group. The same method was repeated for all the finger of both hands. Rolled prints of all 10 digits were taken separately which consisted of 10 different blocks for all fingers of right and left hand respectively. The blood group was asked from each subject and the same was verified from their college identity cards. Each subject was assigned a serial number. The distribution of dermatoglyphic fingertip patterns in both hands of individuals and its relationship with gender and different ABO and Rh blood groups wasevaluated and analyzed.

Results and Discussion

This study comprised of 230 subjects (122 males and 108 females) divulge an association of blood groups with gender and fingerprints. The following tables illustrate the relationship of ABO blood group with gender and pattern types of fingerprints on Right and Left Thumb of all the subjectsrespectively.

Table 1 represents the maximum number of subjects had O+ blood group (44 males and 40 females) followed by B+and lastly none of the subjects having A- blood group. The sequence of blood groups according to their occurrences is as O+> B+> A+> AB+> O-> B-> AB-.Overall, blood group Rh-ve is 6.08% of total population which is very less in comparison to Rh+ve blood group population

Table 3 represents the distribution of fingerprint patterns of right thumb in ABO blood groups according to gender. The whorl pattern has the highest frequency in males whereas in Females loop pattern was found in more numbers and aches were least in both males and females.

Whorl pattern in males according to blood group in Rh+veis given as (B+> O+> A+> AB+) and in Rh-vewere (O-> B-) while A- and AB- had no subjects of whorl in right thumb.Similarly whorl pattern in females according to blood group in Rh+ve were (O+> B+> A+> AB+) and in Rh-ve as (B-> O-> AB-) and A- had no subjects.

Loop pattern in males according to blood group in Rh+ve (O+> B+> A+> AB+) and in Rh-veonly O- had 3 subjects while all others had no subjects. Similarly loop pattern in females according to blood group in Rh+ve were (B+> O+> A+> AB+)

Table 1: Distribution of subjects according to Rh factor of their Blood Group

Blood Group	Male			Female		
	Rh+	Rh-	Total	Rh+	Rh-	Total
A	18	0	18 (14.75%)	17	0	17 (15.74%)
B	42	1	43 (35.24)%)	35	3	38 (31.14%)
AB	12	0	12 (9.83%)	8	2	10 (9.25%)
O	44	5	49 (40.16)	40	3	43 (39.81%)

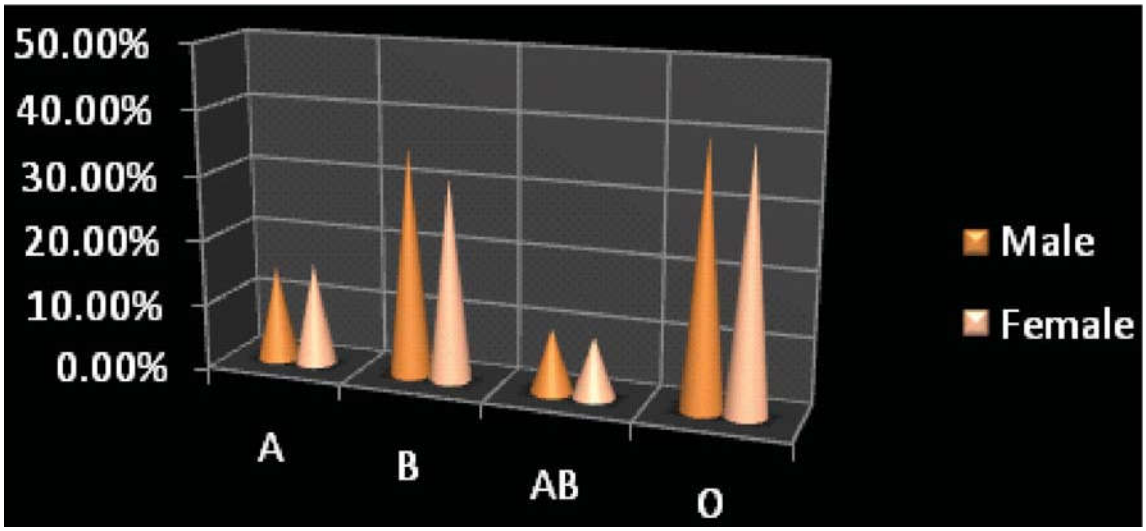

Fig. 1: Percentage of male and females in ABO blood group

Table 2: Gender Distribution according to the blood group

Blood Group	Male	Female	Total
A	18	17	35 (15.2%)
B	43	38	81 (35.2%)
AB	12	10	22 (9.56%)
O	49	43	92 (40%)

Represents the maximum number of subjects had O blood group followed by B, A and AB.

Table 3: Distribution of fingerprint pattern in right thumb (RT) according to blood groups

Blood Group	Whorl		Loop		Arch	
	Male	Female	Male	Female	Male	Female
A+	10	5	8	12	0	0
A-	0	0	0	0	0	0
B+	30	12	11	22	1	1
B-	1	3	0	0	0	0
AB+	7	4	5	4	0	0
AB-	0	1	0	1	0	0
O+	24	18	20	21	0	1
O-	2	2	3	0	0	1

Table 4: Distribution of fingerprint pattern in left thumb (LT) according to blood groups

Blood Group	Whorl		Loop		Arch	
	Male	Female	Male	Female	Male	Female
A+	**7**	**8**	**10**	**9**	**1**	**0**
A-	**0**	**0**	**0**	**0**	**0**	**0**
B+	**19**	**13**	**21**	**20**	**2**	**2**
B-	**1**	**3**	**0**	**0**	**0**	**0**
AB+	**6**	**5**	**6**	**3**	**0**	**0**
AB-	**0**	**0**	**0**	**2**	**0**	**0**
O+	**12**	**22**	**32**	**17**	**0**	**1**
O-	**2**	**2**	**3**	**1**	**0**	**0**

and in Rh-veonly AB- had one subject remaining all other blood groups vis-à-vis (A-, B- and O-) had no subjects.

Table 4 represents the distribution of fingerprint patterns of left thumb in ABO blood groups according to gender. The loop pattern had highest frequency in both males and females followed by whorl and arches were least in both males and females.

Whorl pattern in males according to blood group in Rh+ve (B+> O+> A+> AB+) and in Rh-vewere (O-> B-) A- and AB- had no subjects of whorls in left thumb. Similarly whorl pattern in females according to blood group in Rh+ve were (O+> B+> A+> AB+) and in Rh-ve as (B-> O-); A- and AB- had no subject. Loop pattern in males according to blood group in Rh+ve (O+> B+> A+> AB+) and in Rh-veonly O blood group had 3 subjects. Similarly loop pattern in females according to blood group in Rh+ve were (B+> O+> A+> AB+) and in Rh-ve as (AB-> O-); A- and B- had no subjects.

Arch pattern was found in only B+ and A+ in males and in females it was found in B+ and O+.

Discussion

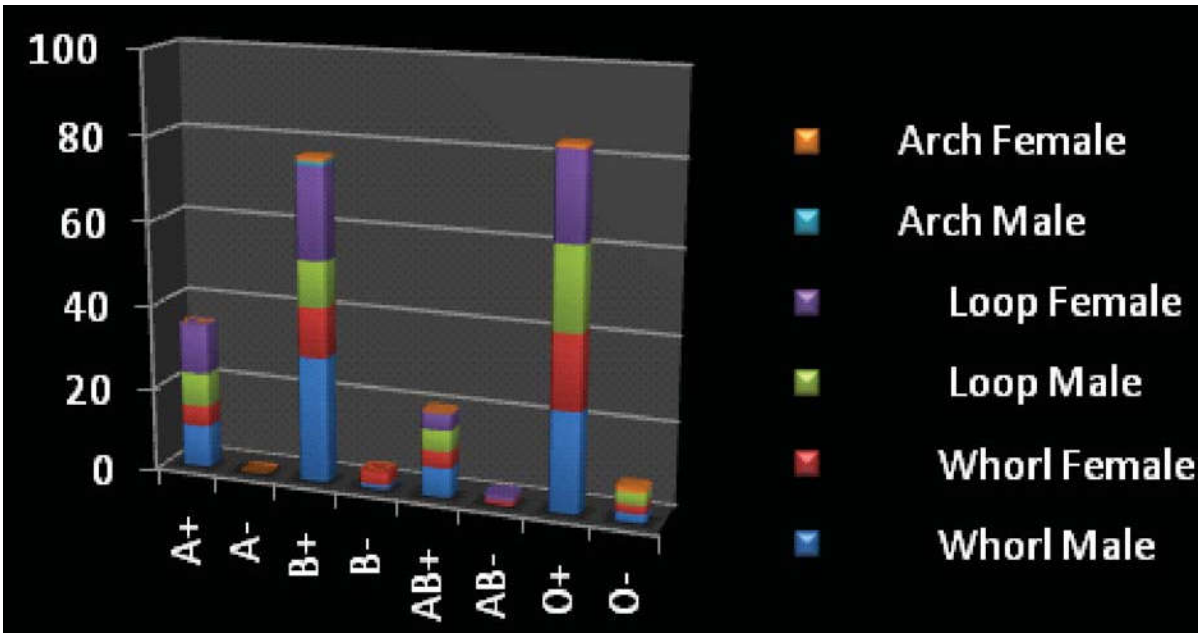

Fig. 2:. Dermatoglyphic Pattern in Right Thumb of Male and Female according to Blood group

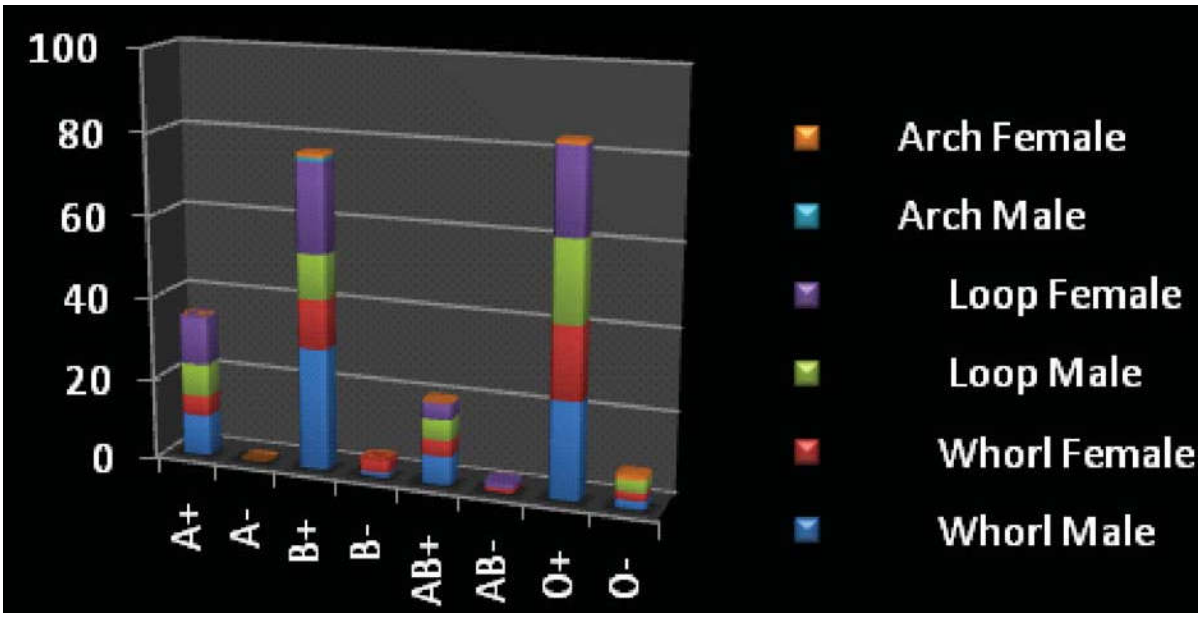

Fig. 3: Dermatoglyphic patterns in left thumb of male and female according to blood group

Table 5: Represents cross reference of some studies on fingerprint and blood group.

Blood Group	Bhavana D			Deepa D.			Narayana L B			Rastogi P.			Ekanem AU			Maled V.			Present study		
	W	L	A	W	L	A	W	L	A	W	L	A	W	L	A	W	L	A	W	L	A
A	130	244	46	128	134	18	51	14	12	171	359	30	191	400	83	365	615	50	30	39	1
B	201	444	95	183	330	17	200	194	24	194	406	40	229	464	97	491	684	75	82	74	6
AB	53	84	3	87	95	8	27	26	8	27	62	1	92	149	46	117	77	16	23	21	0
O	208	406	86	125	253	22	309	302	35	257	394	59	720	1228	301	603	827	80	84	97	3

An association was also found between pattern of fingerprint and ABO blood group in many other studies which was conducted in different geographical areas. On the basis of fingerprints identification occur means determination of the individuality of a person.[9] Individualization through fingerprints is best and cheap and also focus on the forensic law of individuality.As everything is unique with each other similarly the chances of two persons having identical finger impressions is about one in sixty four thousand million population of the world.[10] Monozygotic twins can share the same DNA profile because their existence from one entity butthe fingerprints are unique and gives individuality.[11] The relationship of fingerprint pattern to blood group is in present scope and can be used for personal identification purpose.[12,13]

The results of present study have been compared with these studies mentioned in above table. Preset study showed that Rh+ve have highest number of individuals and the sequence of fingerprint pattern as whorl> loop>arch in RT whereas in LT the loop pattern predominates followed by whorl and then arches. This is similar to all above papers as LT sequence of fingerprint patterns contrary to findings of Bhavana et al.[14] which states that fingerprint sequence as whorl>loop>arch in males and loop>arch>whorl in females. The blood group comparison of fingerprint patterns in the present study shows whorl patterns predominant in females O>B>A>AB which is similar to the results of Bhavana D et al, Narayana LB et al[15], Rastogi and Pillai[16], Ekanem A.U et al.[17], Maled V. et al.[18] but contrary to Deepa D et al.[18] where it is observed as B>A>O>AB. The loop pattern in present study was given as O>B>A>AB in males and B>O>A>AB in females. Bhavana D et al., Rastogi P et al. and Deepa D et al., was similar to female sequence as B>O>A>AB and in Ekanem A.U et al. and Maled V. et al. blood group sequence of loop pattern was similar to males as in present study O>B>A>AB but it was contrary to Narayana L.B et al., who observed this sequence as O>B>AB>A.

The arch pattern was found as B>O>A in present study and AB had no subjects and this sequence is supported by above papers (Table 4) where in all the studies have shown that arch pattern is found to be least occurring in respective of blood group as well as gender.

Conclusion

This study was an attempt to analyze and correlation between fingerprint pattern types in thumbs of both handsand ABO and Rh blood groups of North Indian Population (Haryana region). The fundamental principles of fingerprints are individual characteristic, unique patterns and remain unchanged as fingerprints show individuality of an individual, have unique patterns making it possible to systematically classifyand they never change from birth till death. The findings were as follows:

1. Loops were found in highest numbers in left thumb of males.
2. Whorls were found in highest numbers in right thumb of males and loops in females
3. B+ had more whorls and O+ had more loops in both right and left thumb of male individuals while in females highest frequency of whorls were found in O+ and loops in B+ of both right and left thumbs.
4. AB+ blood group was found in 20 subjects of total 230 samples and showed whorl predominance amongst both males and females in both right thumb and left thumb prints. No such study has been conducted on population of Haryana and nearby regions hence it is an attempt in the present study to observe the relationship of fingerprint patterns with blood groups and gender in north Indian population.

It was thus seen to have some significant correlation of fingerprint patterns with blood group and gender or vis-à-vis.

Recommendation

The results of this study showedthat this study may help in prediction of blood groups but some factors should be considered like geographical area and genetic based studies on fingerprint patterns.

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