Original Article

AN EFFORT TO DETERMINE BLOOD GROUP AND GENDER FROM PATTERN OF FINGER PRINTS

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ABSTRACT

Introduction: Two person having identical fingerprints is about one in 64 thousand millions. A reliable personal identification is critical in the subject of forensics as is faced with many situations like civil, criminal, commercial and latest in financial transaction frauds, where the question of identification becomes a matter of paramount importance. In this study we have made an effort to "study a relationship between pattern of fingerprint, gender and blood group".

Materials and methods: This study was carried out in 2012 on 89 medical students (62 male & 27 female), randomly chosen belonging to the age group 17- 21 at B. J. Medical College, Ahmedabad Gujarat, India. The finger-prints were taken of all ten fingers over unglazed white paper using printer's ink. Pattern of fingerprints were observed by powerful hand lens and recorded. Note was made of the sex, age, ABO blood groups.

Results: Results show that whorls occur more frequently in males, whereas, loops occur more frequently in females. Loops are predominant in blood group B^+ and whorls are predominant in blood group O^+ ($p < 0.05$). We see an association between fingerprint patterns, blood group and gender.

Conclusion: From our study we may conclude that there is an association between distribution of fingerprint patterns, blood group and gender and thus in our opinion, prediction of gender and blood group of a person is possible based on his/her fingerprint patterns.

Key words: Fingerprints, Gender, Blood Groups, Association

INTRODUCTION

Two person having identical fingerprints is about one in 64 thousand millions [1]. Fingerprints are impression of pattern formed by papillary or epidermal ridges of the fingertips and the patterns in fingers do not change during the lifetime of an individual. The combined effect of heredity and environment arbitrates the pattern of ridges. Environmental influence produces stress and tension on the pattern's growth during foetal life[2]. There are four types of patterns observed in the fingers—loops, whorls, arches and composite [3].

Arches are the simplest patterns and also the rarest. There are two types: plain arches and tented arches. In both types the ridge lines flow into the print from one side, rise in the middle of the pattern, and flow out to the other side of the print. The loop is the most common of all the patterns. Loops are formed by ridge lines that

flow in from one side of the print, sweep up in the center 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.

There are four different whorl patterns: the plain whorl, the central pocket loop, the double loop, and the accidental whorl [4]. 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 [5]. The term composite is used for combination of patterns that does not fit into any of the above classifications [6].

A reliable personal identification is critical in the subject of forensics as is faced with many situations like civil, criminal, commercial and latest in financial transaction frauds, where the question of identification becomes a matter of paramount importance. Although human beings have been using fingerprints as a means of identification for a long time but in this study we have made an effort to take step further to "study a relationship between pattern of fingerprint, gender and ABO blood group", so that one can get an idea about the expected blood group and gender from the study of fingerprint pattern and vice versa.

MATERIALS AND METHODS

This study was carried out in 2012 at B. J. Medical College, Ahmedabad Gujarat, India. 89 medical students (62 male & 27 female), belonging to the age group 17- 21 were randomly selected for the study. A Performa was prepared on a durable white paper divided into two, marked as right and left, and each further into five columns (marked as thumb, index, middle, ring and little), rubber stamp ink pads were used for smearing the balls of each finger (blue was found to better as compared to green), imprints were taken of each, pattern of fingerprint were observed by powerful hand lens and recorded.

Note was made of the sex, age, ABO blood group from their identity-cards for studying the relationship between types of fingerprints and relation to ABO blood type and sex. Variables were evaluated and analyzed statistically. Chi-square (χ^2) test was used to compare variables and tests were considered significant when P-Value < 0.05.

RESULTS

Out of 89 students 62 (70%) were male and 27 (30%) were female; the male-female ratio being 2.3: 1. Most common blood groups were 'O' positive and 'B' positive (33%) followed by 'A' positive (21%). AB positive, O negative, AB negative and B negative are rarer being present in 9%, 2% and 1% respectively (Table 1).

Table 1: Distribution of subjects according to blood group and gender

Blood Group	Male (%)	Female (%)	Total (%)
A +ve	15 (24)	4 (15)	19 (21)
B +ve	20 (32)	9 (33)	29 (33)
B -ve	0 (0)	1 (4)	1 (1)
O +ve	21 (34)	8 (30)	29 (33)
O -ve	1 (2)	1 (4)	2 (2)
AB +ve	5 (8)	3 (11)	8 (9)
AB -ve	0 (0)	1 (4)	1 (1)

Males and Females have equal incidence of B positive (32% and 33%) and O positive (34% and 30%) respectively. On the contrary, 'A' positive blood group is found more in males while O negative, AB negative and B negative are more commonly found in females (Table 1).

Table 2: Distribution of pattern in different blood groups

	A +ve	B +ve	B -ve	O +ve	O -ve	AB +ve	AB -ve	Total
Loops	112 (59)	183 (63)	7 (70)	134 (46)	17 (85)	48 (60)	7 (70)	508 (57)
Whorls	45 (24)	75 (26)	2 (20)	87 (30)	1 (5)	24 (30)	1 (10)	235 (26)
Arches	16 (8)	13 (4)	1 (10)	31 (11)	0 (0)	6 (8)	1 (10)	68 (8)
Composites	17 (9)	19 (7)	0 (0)	38 (13)	2 (10)	2 (3)	1 (10)	79 (9)

Figures in parenthesis indicate percentage

Loops are most commonly obtained fingerprints (57%) followed by whorls (26%). Arches and Composite fingerprints are found in 8% and 9% respectively (Table 2). In all the blood groups, proportion of loops was highest. Relatively higher number of whorls is seen in blood group O positive. Among 508 subjects having loop fingerprint, most common blood group seen is B positive ($p < 0.0001$), while O positive is most commonly obtained in subjects with whorls ($p <$

0.0001). O positive is also most common in arches and composite (Table 2, 3).

Loops are more common in females (63% vs. 54%), whereas whorls (28% vs. 23%) and composite (12% vs. 3%) in males; the difference between all three patterns being statistically significant ($p < 0.05$) (Table 4). However, we did not find statistically significant difference in arches in male and females.

Table 3: Comparison of loops and whorls in different blood groups

	Loop			Whorls		
	A +ve	B +ve	O +ve	A +ve	B +ve	O +ve
Yes	112	183	134	45	75	87
No	396	325	374	190	160	148
Total	508	508	508	235	235	235
P Value	P < 0.0001 (S)			P < 0.0001 (S)		

S = Significant

Table 4: Comparison of loops and whorls in sex

	Loop			Whorls			Arches			Composite		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Yes	337	171	508	174	61	235	46	21	67	63	16	235
No	283	99	382	446	209	655	574	249	823	557	254	655
Total	620	270	890	620	270	890	620	270	890	620	270	890
P Value	0.013 (S)			0.049 (S)			0.852 (NS)			< 0.001 (S)		

S = Significant, NS = Not significant

DISCUSSION

The general distribution pattern of fingerprints in our study showed high frequency of loops (57%), moderate whorls (26%), and low frequency of arches (8%), which are in accordance with the study done by Bhardwaja[7].

The present study shows an association between distribution of fingerprint patterns, blood group and gender. Similar to study done by Bhardwaja, Prateek and Gowda & Rao, there is high frequency of loops, moderate of whorls and low of arches in blood groups A, B and O. (correlation more for blood group A[7,8,9]. Contrary to other studies and similar to Sharma frequency of loops in our study is highest in B positive (36%) compared to O positive (26%). Similar to Bhardwaj, AB positive had a higher incidence of whorls compared to other blood groups.

While blood groups A, B and O were found to be the most common (equally predominant) among males, blood groups B and O were the most commonly seen in females. Similar to Prateek et al, the present study also reveals that frequency of loops is greater in females as compared to a higher frequency of whorls in males[8].

According to our study, fingerprints with loops on any suspicious site is suggestive of female with O positive blood group, while whorls suggest B positive blood group.

CONCLUSION

We may conclude that there is an association between distribution of fingerprint patterns, blood group and gender and thus prediction of gender and blood group of a person is possible based on his/her fingerprint patterns.

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