

STUDY OF FINGERPRINT PATTERNS IN RELATIONSHIP WITH BLOOD GROUP AND GENDER IN SAURASHTRA REGION

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ABSTRACT

Finger prints are considered as the best tool of identification of person. Finger print evidence is by far the most effective and reliable evidence in the court of law. Two major aspects which prove the efficiency of finger prints are, the ridges formed during the fetal period do not change their course of alignment throughout the life of an individual until the skin is decomposed and the other one is two finger prints of either a same individual or two different individuals are never alike, they differ in their patterns and ridge characteristics. Due to this unique attribute of finger print, it is widely considered as conclusive evidence in the court of law.

We have carried out a study including 150 medical students of GMERS Medical College Junagadh, Gujarat, among which 75 were male and 75 were female subjects having different ABO blood groups belonging to different age groups. All the 10 fingerprint patterns were divided into Loops, Whorls and Arches. Results indicating that Loops are most commonly found fingerprint patterns while, Arches are least common. Loops dominated in all the Blood groups of both Rh⁺ and Rh⁻ individuals whereas, Whorls were found to be dominating in only O⁻ blood group. The only correlation between gender and finger print patterns in this study is that, Loops and Arches were found in higher frequency in Females compared to Males and whorls were found to be high in males compared to females.

KEYWORDS: Association, fingerprints, blood groups, patterns.

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INTRODUCTION

The skin covers the anterior surface of human hand and plantar surface of the human foot is different in the texture and appearance than the one which it covers the rest of the human body. This skin on the palmar and planter surface is continuously wrinkled with narrow minute ridges known as friction ridges. A finger print is an impression of the friction ridges on all parts

(Figure-1). The dermal carvings or finger prints appear first 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 fetal month. The ridges thus, formed during the fetal period do not change their course or alignment throughout the life of an individual, until destroyed by decomposition of the skin after death [1].

Various physical evidences used for identification of individuals include fingerprints, DNA profiling, lip marks, foot prints, bite marks etc. Fingerprints are highly conservative, constant and individualistic evidence represent the most reliable criteria for confirm identification. Fingerprints follow the Locard's Principle of Exchange. Fingerprints are now a day used in many of the offices, educational institutions to validate the presence of an individual [2].

Fig. 1: A unique hand finger print showing three distinct patterns.



Blood group system was discovered way back in 1901 by Karl Landsteiner. Till date, 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 and O blood group types on the basis of corresponding antigen in plasma. 'Rhesus' system is classified into 'Rh⁺' and 'Rh⁻' according to the presence or absence of 'D' antigen [3].

Here in this research paper we aspire to find a unique co-relationship between fingerprint pattern, blood group and gender in population within Saurashtra region, Gujarat.

MATERIALS AND METHODS

The present study was carried out in GMERS Medical College Junagadh, Gujarat. 150 medical students of this college of various age groups were participated in the study voluntarily and their finger prints were collected. The fingerprints were taken using Camel quick drying duplicating ink. The smeared palm and fingers of both hands were printed on a durable plain paper laid down on a pressure pad which consisted of ten different blocks for ten fingers of right hand and left hand respectively. Both rolled and plane prints of right and left hand were taken (Figure-2). After obtaining the finger prints the basic details of an individual such as name,

age and sex was also recorded. Primary patterns (loops, whorl and arches) were observed with the help of a powerful hand lens. Blood groups of all the persons were also noted for further study. Each finger in the finger print slip was assigned a number in well mannered way. For instance, the 1st number was given to the right hand thumb and 10th number to left hand little.

Fig. 2: Laboratory equipment and materials used to collect fingerprinting patterns of individual.



RESULTS AND DISCUSSION

Table 1: Distribution of Blood Groups according to Gender.

Blood Group	Male	Female	Total
A	17 (11%)	15 (10 %)	32 (21%)
B	27 (17.5%)	28 (19.5%)	55 (37%)
AB	5 (3.5%)	5 (3.5%)	10 (7%)
O	27 (18%)	26 (18%)	53 (35%)
Total	75	75	150

Table-1 shows distribution of blood groups in respect to Gender. Majority of the subjects belonged to the blood group B i.e. 55(37%) followed by O; 53(35%), A; 32(21%) and AB; 10 (7%). Blood group B was predominantly found in females but in males both B and O were equally distributed.

Table 2: Distribution of subjects according to Rh factor of their Blood GROUP.

Blood Group	Rh- Positive	Rh- Negative
A	29 (19.5%)	3 (1.5%)
B	53 (35%)	2 (1%)
AB	10 (6.5%)	0 (0%)
O	52 (34%)	1 (0.5%)
TOTAL	144 (97%)	6 (3%)

In this table, 144 among 150 subjects belonged to Rh⁺ whereas, 6 of 150 subjects were Rh⁻. Out of 144 Rh⁺ subjects majority of the subjects,

53 (35%) belonged to blood group B, 52 (34%) belonged to O, 29 (19.5%) belonged to A and only 10 (6.5%) belonged to blood group AB. Similarly among 6 Rh^{-ve} subjects, 3 (1.5%) belonged to A, 2 (1%) to B, 1 (0.5%) to O and no any individual found to belong with blood group AB. The percentage of Rh^{-ve} subjects was generally less in the study.

Table 3: Distribution of Primary Finger print patterns of all the fingers in both the hands

Fingerprint Atterns	Total Number	Percentage%
Loops	844	56.50%
Whorls	444	29.60%
Aarches	173	11.50%
Total	1500	100%

Table-3 shows distribution of finger print patterns of all the fingers in both the hands. Total no of loops found in all the digits were 844 (58.9%). Similarly numbers of whorls in all of both the hands were 444 (29.6%) and numbers of arches were 173 (11.5%). This table clearly indicates that Loops were more common finger pattern found than the whorls and arches. Finger print pattern were recorded as per figure 3.

Fig. 3: Finger print pattern of right and left hand.



Table 4: The number of the finger print patterns among Males and Females.

Fingerprint patterns	Male		Female	
Loops	400	47.38%	444	52.63%
Whorls	254	57.09%	191	42.90%
Arches	83	48.26%	90	51.73%

Table-4 shows the distribution of finger print patterns within both the genders. Frequency of Loops were found to be higher in females; 444 (52.63%) and whorls were found to be higher in males; 254 (57.09%). Arches were found more in females; 90 (51.73%) as compared to males; 83 (48.26%).

Table 5: Distribution of Fingerprint Patterns among A, B, AB, O blood groups with Rh factors.

Type of pattern	Blood group A		Blood group B		Blood group AB		Blood group O	
	Rh +	Rh-	Rh+	Rh-	Rh+	Rh-	Rh+	Rh-
Total loop	168	18	316	14	60	0	307	2
Percentage	57.94	60	59.57	67.5	60.76	0	59.11	20
Total whorls	91	8	147	4	38	0	148	7
Percentage	31.28	26.67	27.71	17.5	37.6	0	28.52	70
Total arches	31	4	67	2	2	0	64	1
Percentage	26.67	13.34	12.71	15	1.53	0	12.35	10
Total	290	30	530	20	100	0	520	10

Table-5 shows the distribution of the finger print patterns among ABO blood groups of all the subjects. More numbers of loops were found in blood group B i.e. 59.57% followed by O i.e. 59.11% among the Rh⁺ individuals. Whereas, the prevalence of whorl predominantly found in the blood group O within Rh^{-ve} individuals. Whorls in Rh⁺ individuals were equally dominant in both B and O blood groups; Arches were least commonly found in all the blood groups. Least numbers of arches were seen in the blood group AB and more number in B.

DISCUSSION

The present study is an approach to further classify finger print patterns. These patterns fall into three general classes called Arches, Loops, and Whorls. Arches are the simplest patterns and also the rarest. There are two types: plain arches and tented arches.

Loops are designated as being either radial or ulnar, depending on which side of the finger the lines enter. The loop is the most common of all the patterns. There are four different whorl

patterns: the plain whorl, the central pocket loop, the double loop, and the accidental whorl. The accidental whorl can be any pattern or combination of patterns that does not fit into any of the above classifications. The term "Compo-site" is used to describe such patterns. Positive identification using fingerprints can be established only if 16 to 20 points of similarity exist in the minutiae [4].

This study was an approach to associate fingerprints, blood groups and gender. Blood group B was predominantly found among the subjects followed by O. The distribution of primary fingerprints among the subjects was high frequency of loops, moderate of whorls and low of arches. Bharadwaja et al [2] conducted a study during 2000-2001 on 300 medical students with different ABO blood groups in Rajasthan which revealed that individuals with blood group A have more of loops, while that of blood group AB had more of whorls.

Similarly, Rastogi and Pillai [5] also conducted a study among 200 medical students of Kasturba Medical College, Mangalore which showed that blood group A had higher frequency of Loops and blood group O had higher frequency of whorls and arches were found to be high in blood group A [5]. Results of the present study differ comparatively.

CONCLUSION

Present study is an attempt to analyze and correlate fingerprint patterns with gender and blood group of an individual. Although we know that fingerprints are never alike and they never change from birth till death, this study is an attempt made by us to associate fingerprints with gender and blood group of an individual which may in turn enhance the authenticity of the fingerprints in identification and detection of criminals⁶. From the above study the following results were found:

1. Loops are the most commonly found fingerprint pattern and Arches are the least common.
2. Blood group B positive is the most common and O negative and AB negative is the rarest.
3. More number of whorls were found in O^{ve} compared to other Rh^{-ve} blood groups which is consistent with observation of Dr. Rastogi and Pillai⁵ and Kanchan and Chattopadhyay⁷.
4. Loops and arches were common in Blood group B and O.
5. Blood group B^{+ve} and O^{+ve} equally had highest number of whorls.
6. Least arches seen in Blood group AB.
7. Loops and Arches were highest in Females and Whorls highest in Males.
8. Highest numbers of Loops were found in blood groups B and O compared to A and AB.

Conflicts of Interests: None

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