Original Research Paper

Pattern of Fingerprints in Different ABO and Rh Blood Groups

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Abstract

Identification is a vital of crime investigation and practice of forensic medicine. Many characters are used for identification. To establish the absolute identity among the many characters finger print is one of the most important tool easily available. It is one of the oldest and reliable methods of identification. Many studies conducted worldwide have proved the correlation between fingerprints and different ABO blood groups along with certain diseases. The present study was conducted on 400 Indian medical students having different ABO blood groups. Their fingerprinting and blood grouping was done, tabulated and analyzed. The study revealed that there is an association between distribution of fingerprint patterns, blood group and gender. Loop was most frequently seen fingerprint followed by whorl and arch. O positive is most common blood group and AB negative is rarest. Loops are predominant in blood group O followed by B and AB in both Rh positive and Rh negative.

Key Words: Fingerprint, Blood Group, Gender, Identification, Forensics, Disease

Introduction:

Identification has paramount importance in the practice of Forensic Medicine. Identification of individual in unidentified bodies and criminals by fingerprints left at crime scene is vitals of crime investigation. Identification is defined as determination of the individuality of a person based on certain physical characteristics which are unique to that individual. [1]

Many characters are used for identification like race, religion, sex, age, complexion, external features, moles, hair, scars, tattoo marks, deformities, footprints, fingerprints, occupational marks, teeth, hand writing, cloths, personal articles etc. [2]

To establish the absolute identity among the above characters finger print is one of the most important tool easily available, because it has been estimated that chances of two persons having identical fingerprints is about one in sixty four thousand million population of the world. [3]

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It was in early 20th century that fingerprinting was accepted formally as a valid personal identification method by law enforcement authorities and become a standard procedure in Forensics.

Individual can change his behavior, physical appearance, voice, color etc. but biological characteristics like fingerprints and blood groups cannot be altered or replicated. [4] Hence they are considered more reliable, authentic and credible in Forensic science.

Fingerprints are impressions of patterns formed by the papillary/epidermal ridges of finger tips. [1] This ridge pattern of fingers appears in the form of volar pads around 6-8 weeks after conception. These volar pads begin to recede around 10-12 week, around 13th week skin ridges appear and take the shape.

At last around 21st week after conception the fingerprint patterns are completed. [4] The volar skin is composed of two layers, the outer epidermis and inner dermis. [5] Pattern of these papillary ridges remains unchanged in an individual throughout life. [5]

The secretions in the fingerprints contain residues, various body fluids and their metabolites which can be detected and used as additional factor for identification in Forensics. Fingerprints present at the scene of crime can be used to identify suspects, which will help the law enforcing authorities to arrest/exclude the accused and also to process the investigation in right direction. Fingerprints aren't just for identification anymore. Studies determined your

fingerprint patterns may hold clues to revealing potential health threats, including certain diseases and cancers.

Due to immense potential of fingerprints as 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. This correlation between fingerprint pattern and these parameters may help in using fingerprints as an important aid in sex and blood group determination and vice versa, thus, enhancing the authenticity of fingerprints in detection of crime and criminals.

Aims and Objectives:

- To study the pattern of fingerprints in Indian population.
- To study the pattern of blood groups in Indian population.
- To observe any correlation between pattern of fingerprints and blood groups.

Materials and methods:

The study was conducted in the Department of Forensic Medicine, SDM College of Medical Sciences & Hospital, Dharwad (Karnataka). 400 (200 male and 200 female) medical students were selected randomly for the study. Informed consent was obtained prior to obtain prints. Their fingerprints were taken by using ink and slab method and blood grouping was done using slide method.

Data regarding age, sex and address were recorded in proforma. The digits were numbered as per Henry's classification system. (Table 1) The patterns of fingerprints were observed by powerful hand lens and classified accordingly. This data was analyzed statistically and conclusion was drawn.

Results and Observations:

In the present study loop (55%) was the most frequently observed pattern in both males and females, followed by whorl (34.4%) and arch (5.5%). (Table 2) Majority of the individuals in the study belonged to blood group O (37.7%) followed by B (31%), A (25.7%) and AB (5.3%). Blood group B found to be most common among males whereas O among females.

Majority of Rh positive individuals were found in blood group O (38.6%), followed by B (31.2%), A (25%) and AB (5.4%), whereas Rh negative individuals were more common in blood group A (35.7%), followed by B (32.1%), O (28.6%) and AB (3.6%). (Table 3)

Frequency of loops was highest in both Rh positive and Rh negative individuals of ABO blood groups followed by whorls and arches, except AB blood group where whorls predominate followed by loops and arches.

Incidence of loop was highest in O (37.5%) blood group followed by B (31.1%), A (27.9%) and least among AB (3.5%). Whorls showed highest incidence in O (39.4%) blood group followed by B (29.8%), A (23.2%), and least among AB (7.6%). Arches were highest in O (36.3%) blood group followed by B (33.9%), A (22.6%), and least among AB (7.2%). (Table 4)

Discussion:

The present study reveals that loop was the most frequently observed pattern of fingerprint followed by whorl and arch in both males and females. Gender dimorphism was not observed. The pattern observed was similar to the study conducted on south Indian population by Gangadhar MR and Nithin MD. [6, 2]

The studies conducted in Southern Nigeria, India, Libya, Kenya and Tanzania revealed similar ridge pattern. [5,7-9]

The findings does not coincide with the study conducted in New Zealand which revealed abundant whorls (55.6%) than loops (43.6%) in males and much higher frequency of whorls (65.6%) and lower frequency of loops (33.7%) in females. [10]

Majority of the subjects in the study belonged to blood group O followed by blood group B, A and AB. Majority of subjects (372) were Rh positive while only 28 were Rh negative. Blood group B found to be most common among males while O among females. [11] These findings does not coincide with the study conducted by Mehta AA, which revealed B as predominant blood group and AB as least common among the Indian population. [7]

Whereas the study conducted by Fayrouz INE revealed O as most common blood group followed by A, B and AB in Libyan population. [8] Our study asserted that blood groups O, B and A are associated with more loops and less whorls than blood group AB. Whereas blood group AB is more associated with Whorls than loops. [11-13]

The present study reveals that there is an association between distributions of fingerprint pattern in relation to ABO blood groups. High frequency of loops, moderate of whorls and low of arches was observed. This is similar to the studies conducted by Bharadwaj A and Gowda MST. Similar findings were seen in Rh positive and Rh negative individuals. [12, 14]

Apart from Forensic implications the pattern of fingerprints will help us in prediction of certain diseases. Carcinoma of breast is frequently associated with individuals having six/more digital whorls. [15] Alzheimer's disease is associated with individuals having eight/more

digital loops. [16] Similar prediction of various diseases can be easily made out with the help of blood group of the individual.

Blood group O is associated with skin cancer and Hodgkin's disease, whereas blood group A is associated with ovarian, endometrial and stomach carcinoma. [17-19] Rh positive individuals are more frequently associated with colon cancer. [20]

Conclusion:

Our study concludes that there is an association between distribution of fingerprint patterns, blood group and gender. The most frequent pattern of fingerprint in Indian population was loop followed by whorl and arch. Gender dimorphism was not observed.

O positive is most common blood group and AB negative is the rarest. Loops are predominant in blood group O, B, and A in both Rh positive and Rh negative. Whorls are predominant in blood group AB.

With the recent advances in fingerprint sensing technology and improvement in the accuracy the biometric technology matures. Fingerprints will remain an integral part of the preferred biometric based identification solution in future. A relationship of fingerprint pattern to blood group presents scope for additional identification data as personal identification and also for possible prediction of certain diseases.

The association between whorl pattern of fingerprint and breast cancer might be potentially used for screening of breast cancer in under developed and developing countries, here access to mammograms may not be possible. These additional factors can be validated along with increasing the accuracy of prediction by encouraging and conducting the study on larger population groups.

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Table 2: Sex wise Pattern of Fingerprints

Fingerprint	Male (%)	Female (%)	Total (%)
Loop	1067(48.4)	1136(51.6)	2203(55)
Whorl	709(51.5)	668(48.5)	1377(34.4)
Arch	109(49.3)	112(50.7)	221(5.5)
Composite	115(57.8)	84(42.2)	199(5.1)

Table 1: Henry's Classification System

Finger	Left Little	Left Ring	Left Middle	Left Index	Left Thumb	Right Thumb	Right Index	Right Middle	Right Ring	Right Little
Number	10	9	8	7	6	1	2	3	4	5

Table 3: Pattern of Blood Groups in Male and Female

Blood Group	Male (%)	Female (%)	Total (%)	Rh +ve (%)	Rh -ve (%)	Total
A	44(42.7)	59(57.3)	103(25.7)	93(25)	10(35.7)	103
B	73(58.4)	52(41.6)	125(31.3)	116(31.2)	9(32.1)	125
AB	13(61.9)	8(38.1)	21(5.3)	20(5.4)	1(3.6)	21
O	70(46.4)	81(53.6)	151(37.7)	143(38.6)	8(28.6)	151

Table 4: Pattern of Fingerprints among ABO & Rh Blood Groups

Finger Print	A (%)	B (%)	AB (%)	O (%)	Total (%)	Rh +ve (%)	Rh -ve (%)
Loop	615(27.9)	684(31.1)	77(3.5)	827(37.5)	2203(55)	2057(55.3)	146(52.1)
Whorl	320(23.2)	410(29.8)	104(7.6)	543(39.4)	1377(34.4)	1278(34.4)	99(35.4)
Arch	50(22.6)	75(33.9)	16(7.2)	80(36.3)	221(5.5)	203(5.4)	18(6.4)
Composite	45(22.6)	81(40.7)	13(6.5)	60(30.2)	199(5.1)	182(4.9)	17(6.1)
Total	1030	1250	210	1510	40000	3720	280