



A Study on Fingerprint Patterns and Blood Groups in Relation to Personality – A Report from Nepal

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Abstract

Context: Finger prints are the impressions made by fine ridges present on finger tips which are highly individualistic. These impressions are used in identification of an individual. There are four major types of finger print patterns. They are: loop, whorl, and arch and composite. Human blood groups are divided mainly in two ways on the basis of presence or absence of protein antigens present on human RBC (Red Blood Cells) membrane. They are classified as ABO system and Rh system. According to ABO system, there are four types of blood groups, namely groups A, B, AB and O. These blood groups may be Rh positive or Rh negative. Personality is a totality of the specific characteristics possessed by an individual. Extroversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience are five major traits of personality.

Aims: The objectives of the study were to investigate the distribution patterns of blood groups, finger prints, assessment of the personality traits, and to find out the relationship between these entities.

Methods: Current study is a non-interventional, cross sectional study conducted on medical students of 5th and 6th batches at Nepalese Army Institute of Health Sciences (NAIHS). The native students aged 18-25 years participated in the study which was completed in five months. Finger prints were recorded on a clean, white paper using plain method. Blood groups of the same individuals were noted from their college identity cards. Personality assessment was done by the help of 'The Big Five Personality Inventory'. Among 175 randomly selected Nepalese students, only 150 met the criteria and included in the study. For data entry and analysis, MS-Excel 2016 and IBM SPSS Statistics 20 parameters were used.

Results: The most common and dominant finger print pattern found was loop (58%) followed by whorl (32.7%) and arch (3.3%). Blood group B (35.3%) and Rh positive (94%) was found to be most common. Most of the students scored higher (>30) in Agreeableness, Conscientiousness and Openness to Experience. However, the students scored lower (<30) in Extroversion and Neuroticism.

Conclusion: There was no statistically significant relationship amongst finger prints, blood groups and personality traits. Our findings have been substantiated by earlier reports with some contradictions.

Keywords: Finger prints; blood groups; personality traits; Extroversion and Neuroticism score.

Introduction

Fingerprints are impressions made by minute ridges or patterns found on fingertips. The formation of ridge patterns of finger tips was completed by 24 weeks of intrauterine life. At birth, the skin

of bulb of fingers and toes, and a part of palm and soles has a fine pattern of ridges. Dermatoglyphics is the study of ridge patterns in the skin. Sir William Janus Herschel, in 1858, first used this system in India. Later, in 1892 Sir Francis Galton systematized this method,

and first Fingerprint Bureau was established in Kolkata [1]. Human fingerprints are detailed, nearly unique, difficult to alter, and durable over the life of an individual, making them suitable as long-term markers of human identity. No two fingerprints have ever been found to be identical and even identical twins have different prints [3-4]. Sometimes, fingerprints were found helpful to determining gender and blood group as well. On the other side, "Lip prints" were also found very important because of their uniqueness [5,6]. Interestingly, the surface features and shape of tongue were found to be characteristic of every individual; hence, the tongue print could be used as a tool for identification purposes [7].

History

Finger prints have been used since 3000 BC as suggested by Chinese historical documents. Both the Qin and Han Dynasties (221 BC – 220 BC) were reported to use the hand prints for identification purpose and as forensic record [3,8]. Ancient Indian documents also suggested the practice of using finger prints for identification. Papillary ridge like carvings of the pre-historic age have been discovered on the cliff of Nova Scotia though there is no evidence to point out the age of these carvings. The first scientific study on finger-prints was conducted by Prof. M. Melphinge (1680) and Prof. J.E. Purkinje classified them into 9 types. Sir William J. Harshel (East India Company), used palm-print in the legal identification of pensioners. In the year 1892, Sir Frances Galton published his work on finger prints in the form of a book titled "Finger Print" which was used officially in criminal investigation. Later, this system was used extensively in different parts of the world and was popularly known as "Galton System of Identification." Nevertheless, the use of finger print reached Scotland Yard in 1892 by Sir Edward Henry. Henry Classification System online was given by Wikipedia Encyclopedia in 2018. The Henry Classification System has generally been replaced by ridge flow classification approaches [2,3,11].

Classification

Sir Henry Galton (1892), depending on the arrangement of papillary ridges classified the fingerprints into four major types: (a). Loop (65% of population); (b). Whorl (25% of population); (c). Arch (7% of population); and (d). Composite/Compound (2-3% of population). To these four patterns, a fifth one called "Accidental variety" is added, wherein no specific ridge pattern is available.

Loop

Loops usually begin on one side of the finger and end on the same side. When this happens from ulnar side, it is called ulnar loop; if on radial side, then it is called radial loop.



Picture 1: Picture presenting loop pattern.

Whorl

This could be having multiple circular/oval ridges, one around the other, or a single ridge, round in multiple rounds. There are two types of whorl- Spiral and Circular.



Picture 2: Picture presenting Whorl pattern.

Arches

The ridges run from one side to other side in an arch like fashion. There are two types of arches- Plain and Tented.



Picture 3: Picture presenting Arches pattern.

Plain arch is wave like extending from one side of the finger to the other side. Tented arch is sharp and spike like.

Composite:

It is a combination of more than one pattern, either a combination of arch, whorl or loop, or two different patterns- two whorls/ two arches/ two loops [2-8].



Picture 4: Picture showing composite pattern.

Our hands secrete sweat like other body parts. This sweat contains fat. The presence of fat makes the surface of the hand greasy. When this greasy surface comes in contact with smooth surface, it leaves an impression on that surface, which is visible as fingerprint.

Medico-legal importance

Identification

- During mass disaster.
- Criminal identification in the Court of Law.
- In case of impersonation.
- In legal document to maintain identity in bank, service record, etc.

Poroscopy

- Study of the impression of sweat pores.
- The pores form a strong basis to be used for fingerprinting, especially in those cases where sufficient ridge patterns are not available for any reason. It is worth mentioning that Fingerprints have been the gold standard for personal identification within the forensic community for more than one hundred years [3,11,15].

Techniques of fingerprinting

The hands are washed, cleaned and dried, as otherwise the print will be blurred. The fingerprints are recorded on a clean (un-glazed) white paper using printer's ink. The following two methods are commonly used. (i). Plain Print: It is taken by applying the ink to the tips of the fingers and placing the fingers directly on paper. (ii). Rolled Print: It is taken by rolling the fingers on paper from outward to inward in such a way as to obtain an impression of the whole tip.

Types of Fingerprinting

The most reliable fingerprints are as follows:

Latent Print: It is an invisible or barely visible impression left on smooth surface. (b). **Visible Print:** It is formed by fingers stained with ink or blood or any other medium. (c). **Plastic Print:** It is an impression made on a soft surface such as soap, cheese, mud, pitch, candles, thick dried blood, adhesives, etc. [1-5].

Blood groups

The human blood consists of plasma and cells. The blood cells are of three types- The Red Blood Cells (Erythrocytes), White Blood Cells (Leucocytes) and Platelets (Thrombocytes). The membrane of Red Blood Cells consists of different antigens which become the basis for blood grouping. These antigens (which are chemically proteins) are called agglutinogens and the corresponding antibodies are called agglutinins. When a particular agglutinin is present, then the corresponding agglutinins in plasma are absent and vice versa. This is called Landsteiner's Law [6-10].

Safe blood transfer in a locality is generally based on the knowledge of distribution of ABO-Rh(D) blood groups [7-13]. There are two major blood grouping system which are clinically significant [9, 13]. They are:

- ABO Blood System and
- Rh System.

The antigens (agglutinogens) are genetically determined. In ABO system, the agglutinogens are 'A' and 'B'. The A, B and O characters are inherited by means of three allelomorphous genes, every individual having two chromosomes each carrying A, B or O, one from each parent [10]. Thus the possible genotypes are AA, AO, BB, BO, AB and OO. Group A type may thus be AA or AO and group B type may be BB or BO. However, there is no true O antigen. Hence,

the clinically significant blood group in humans comprise of A, B, AB and O. These may be either Rh+ve or Rh-ve [5,11-13].

Personality

Personality is defined as enduring and pervasive motivations, emotions, attitudes and traits possessed by an individual. It is a deeply ingrained pattern of behaviors in a person. It includes modes of perception related to oneself and the surrounding environment. Personality traits are normal, prominent aspects of personality. Personality disorders result when these personality traits become abnormal and maladaptive. This consequently causes significant social and occupational impairments. Such disorders can lead to excess subjective distress which is difficult to cope with [9-13].

Clinicians have generally derived these types of personality:

- Solitary and self-conscious type
- Sociable and outgoing type
- Anxious and timid type

However, psychologists have adopted a more rigorous scientific approach using personality traits such as anxiety, energy, orderliness and self-reliance. There are many theories which explain the development and function of personality [7, 8]. Mainly, there are five different types of personality traits. They are as follows:

- Extroversion – highly interactive, enthusiastic, action oriented and talkative
- Agreeableness – helpful, generous, kind and willing to compromise their interests with others
- Conscientiousness – disciplined and dutiful
- Neuroticism – emotionally unstable with tendency to have anger, fear and anxiety
- Openness to Experience – intellectually curious, creative, sensitive to beauty and open to emotions.

Literature review blood group and personality

There were many researches done on blood group and personality. MANOVA results showed that there is no relationship between blood type and personality [9]. Similarly, a study carried out in 400 Canadian students suggested that no relationship exist between blood type and personality traits [10]. But according to one international study, blood group polymorphisms of the ABO system are related to personality differences with AB being more frequent among introverts, and the ratio A/B being higher among

stable subjects. This study confirmed two things: Japanese, as compared with British, have a higher proportion of AB carriers and a lower A/B ratio, and Japanese are more introverted and more neurotic than British [11]. A study of 103 college students in showed no relationship between blood type and intelligence, emotions and personality [12]. In a study done in Asia, it was found that there is no significant relationship between blood type and personality except for type AB females who scored lower on conscientiousness domain [13].

There are no significant researches done on the relation between fingerprints and personality. However, American doctors have noticed a strong correlation between fingerprints and brain development. They discovered this in babies who had no brains at the time of their birth, where they found that they had no fingerprints either [14].

Objectives of the study

The objectives of our study were as follows:

- To record the fingerprint samples of individuals and interpret each of them
- To study the distribution pattern of blood group and fingerprints.
- To assess the personality traits of the individuals
- To explore the relationship between dominant fingerprints and personality traits.
- To explore the relationship between blood groups and personality traits.
- To explore the relationship between blood groups and dominant finger prints.

There are no sufficient studies based on the Nepalese population regarding fingerprints, so this study will provide information regarding pattern of distribution of fingerprints and their correlation with different blood groups and personality traits.

Materials and Methods

Materials Required/used:

- Stamp pads
- Paper
- Pens and pencils
- Magnifying lens
- The Big Five Personality Inventory
- Personality scoring key

Methods used

Study type

Cross-sectional study design was adopted.

Sampling

- Simple random sampling.
- Sample Size – 175 (all the participants were from NAIHS-COM, Kathmandu).

Selection criteria

Inclusion criteria

- Those students were included who gave positive consent for participation.
- Only Nepalese medical students aged 18-25 years participated in the study.
- The participants had no visible pathology on finger tips.
- All participants were free of any known mental disorders.

Exclusion criteria

- NAIHS-COM, Kathmandu students were randomly selected. The students who gave no consent were excluded from the study.
- The students aged below 18 years or above 25 years were excluded.
- Having wounds or abrasions on their fingertips were excluded.
- Foreign medical students were excluded.

Among a total of 175 students initially selected, only 150 met the inclusion criteria of the present study.

Recording of finger prints

- The students were selected randomly from NAIHS-COM, Kathmandu (Nepal).
- They were fully explained about purpose and procedure of the study, and verbal consent was taken.
- Each one of them was asked to wash, clean and dry their hands.
- Their finger prints were recorded on a white sheet using the stamp pad. Plain print technique of fingerprinting was selected. For this, ink was first of all applied to each fingertip and then each of the fingertips was placed directly on the paper.

- Blood groups of the students were taken referencing their identity card (Blood group was tested during their enrollment to the college).

Assessment of personality was done by the help of “The Big Five Personality Inventory.” This inventory consists of 50 statements which indicate different human characters. 10 out of 50 characters indicate one personality trait. In total, this inventory helps to assess five personality traits of an individual. The five traits are: (i). Extroversion; (ii). Agreeableness; (iii). Conscientiousness; (iv). Neuroticism; and (v). Openness to experience.

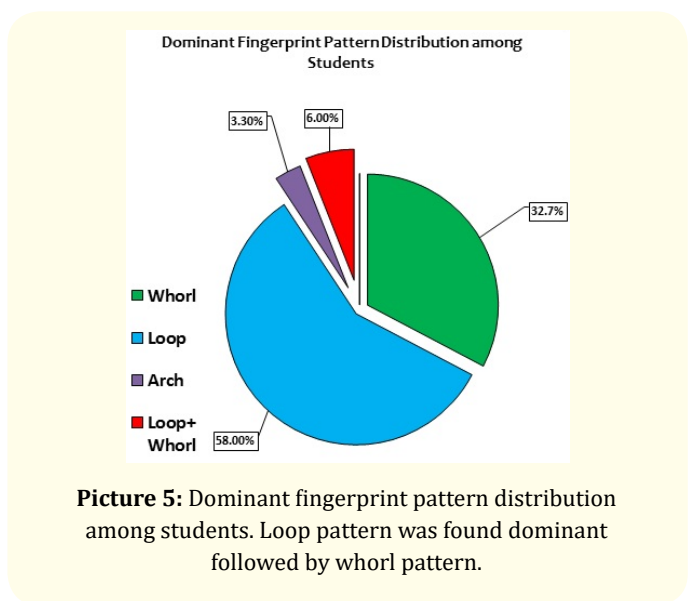
Students were asked to give their relevant score (1 to 5) to each item (character) out of which;

- 1 = disagree
- 2 = slightly disagree
- 3 = neutral
- 4 = slightly agree
- 5 = agree

After data collection, the total scores of a student for each of the personality trait were calculated by using SPSS Statistics-20. Value P<0.05 was considered statistically significant.

Results

The results of the present study are depicted in Table 1-12 and Picture 5.



Picture 5: Dominant fingerprint pattern distribution among students. Loop pattern was found dominant followed by whorl pattern.

Scores	Frequency	Percentage (%)
10 - 19	14	9.3
20 - 29	75	50
30 - 39	52	34.7
40 +	9	6
Total	150	100

Table 1: Extroversion score is presented in the following table. The students scored lower (<30) in Extroversion.

Scores	Frequency	Percentage (%)
10 - 19	1	0.7
20 - 29	12	8
30 - 39	116	77.3
40 +	21	14
Total	150	100

Table 2: Agreeableness Score is presented as follows. The students scored higher (>30) in Agreeableness.

Scores	Frequency	Percentage (%)
10 - 19	3	2
20 - 29	34	22.7
30 - 39	94	62.7
40 +	19	12.7
Total	150	100

Table 3: Conscientiousness Score is presented in tabular manner as follows.

The students scored higher (>30) in Conscientiousness.

Scores	Frequency	Percentage (%)
10 - 19	0	0
20 - 29	110	73.3
30 - 39	39	26
40 +	1	0.7
Total	150	100

Table 4: The tabular presentation of Neuroticism Score.

The students scored lower (<30) in Neuroticism.

Scores	Frequency	Percentage (%)
10 - 19	0	0
20 - 29	20	13.3
30 - 39	116	77.3
40 +	14	9.3
Total	150	100

Table 5: Openness to Experience Score is presented as follows.

The students scored higher (>30) in Agreeableness and openness to experience.

Personality Traits	Higher Scores	Lower Scores
Extroversion	Highly interactive Enthusiastic Action oriented Talkative	Less energetic Introverted Less interactive
Agreeableness	Helpful, Kind Generous Willing to compromise their interests with others	Uncooperative Unconcerned with others wellbeing Suspicious
Conscientiousness	Disciplined Dutiful	Undisciplined
Neuroticism	Emotionally unstable Tendency to experience anger, anxiety and depression.	Emotionally stable Control over the behaviours
Openness to Experience	Intellectually curious Creative Sensitive to beauty Open to emotions	Non-curious Reserved attitude No tendency to appreciate beauty

Table 6: Table describing the traits on the basis of scores.

ABO Blood Group Distribution			Rh Factor Distribution		
Blood Group	N	%	Rh Factor	N	%
A	39	26.0	Negative	9	6
B	53	35.3	Positive	141	94
AB	12	8.0			
O	46	30.7			
Total	150	100	Total	150	100

Table 7: Distribution of ABO blood groups and Rh factor.

Parameters	Test	Extroversion
ABO blood groups	Pearson Correlation	-0.146
	Significance (2-tailed)	0.074
Rh blood groups	Pearson Correlation	0.030
	Significance (2-tailed)	0.717
Dominant finger prints	Pearson Correlation	-0.055
	Significance (2-tailed)	0.501

Table 8: Correlation of blood groups and dominant finger prints with Extroversion (p>0.05).

- Dominant fingerprints and blood groups were negatively correlated with personality extroversion.

Parameter	Test	Agreeableness
ABO blood groups	Pearson Correlation	-0.087
	Significance (2-tailed)	0.291
Rh blood groups	Pearson Correlation	-0.025
	Significance (2-tailed)	0.764
Dominant finger prints	Pearson Correlation	-0.182
	Significance (2-tailed)	0.026

Table 9: Correlation of blood groups and dominant finger prints with Agreeableness (p>0.05).

- ABO blood groups, Rh blood groups and dominant finger prints were negatively correlated with personality trait agreeableness.

Parameter	Test	Conscientiousness
ABO blood groups	Pearson Correlation	0.018
	Significance (2-tailed)	0.827
Rh blood groups	Pearson Correlation	-0.022
	Significance (2-tailed)	0.791
Dominant finger prints	Pearson Correlation	-0.057
	Significance (2-tailed)	0.490

Table 10: Correlation between blood groups and dominant finger prints with Conscientiousness *P>0.05

Parameter	Test	Extroversion
ABO blood groups	Pearson Correlation	0.026
	Significance (2-tailed)	0.750
Rh blood groups	Pearson Correlation	-0.037
	Significance (2-tailed)	0.654
Dominant finger prints	Pearson Correlation	0.003
	Significance (2-tailed)	0.969

Table 11: Correlation of blood groups and dominant finger prints with Neuroticism. * p>0.05

- ABO blood groups and dominant finger prints are positively correlated with personality trait neuroticism. Rh blood group is negatively correlated with neuroticism.

Parameter	Test	Openness to experience
ABO blood groups	Pearson Correlation	0.010
	Significance (2-tailed)	0.901
Rh blood groups	Pearson Correlation	0.050
	Significance (2-tailed)	0.541
Dominant finger prints	Pearson Correlation	-
	Significance (2-tailed)	-

Table 12: Correlation of blood groups and dominant finger prints with Openness to experience. P>0.05.

The comparison showed statistically non-significant changes.

Discussion

The present study showed that loop was the most common fingerprint pattern among the participants. Arch was found to be the least common pattern. There was an evidence of correlation among fingerprint patterns, blood group and gender. The existence of such relationship might lead to prediction of certain disease states besides identifying the victims on a crime scene. Our findings are substantiated by an earlier report on the use of blood group and fingerprint pattern in identification of criminals and in situations such as mass disasters [13,14].

The present investigations demonstrated that fingerprints were completely unique to every individual person and stay the same up till the death. Hence, finger prints are safely used to identify the criminals. Furthermore, it was confirmed that there was an association between distribution of fingerprint patterns, gender, blood group and common clinical complaints. Current study revealed a significant association of blood groups O, A, B, AB to Hypertension, Peptic ulcer, Anaemia, Rheumatoid Arthritis, Gastritis, Diabetes and Bronchial asthma. The predominance of loop was highest among all blood groups [15,17].

Our results were in agreement with an earlier investigation showing that: Loops were the most common finger-print pattern followed by Arches. However, Whorls and mixed patterns were moderate. It was also found that Loops had highest numbers in subjects having blood groups O, B as compared to blood groups A and AB. These findings supported the earlier reports indicating Blood group O positive to be the most common group. Nevertheless, O negative and AB negative groups were the rarest. In females: Loops,

whorls, mixed and arches were very common; whereas, Group A was the most common blood group among males. Blood group O and B, were the most commonly seen blood groups in females. Some clinical complaints existed in all the blood groups investigated [14,15].

The most frequent fingerprint pattern was ulnar loop in the total population, as well as in the sex wise distribution [15]. The results of the present study clearly verified that dominant fingerprints and blood groups were negatively correlated with personality extroversion. ABO blood groups, Rh blood groups and dominant finger prints were negatively correlated with personality trait extroversion and agreeableness. Nevertheless, all the correlations were statistically non-significant ($p>0.05$). Rh blood groups and dominant finger prints were negatively correlated with personality trait conscientiousness. ABO blood group was positively correlated with conscientiousness. Nonetheless, all the correlations were statistically insignificant [16,17].

In the present study, ABO blood groups and dominant finger prints were positively correlated with personality trait neuroticism. Rh blood group was found to be negatively correlated with neuroticism. All the correlations were statistically non-significant ($p>0.05$). The correlation of blood groups and dominant finger prints with Openness to experience changes were also found to be statistically non-significant [18].

Rh blood groups and dominant finger prints were negatively correlated with personality trait conscientiousness. ABO blood group was found to be positively correlated with conscientiousness. But, all the correlations were insignificant ($P>0.05$). Furthermore, ABO blood groups and dominant finger prints were positively correlated with personality trait neuroticism. Rh blood group was negatively correlated with neuroticism. However, all the correlations are statistically not significant ($p>0.05$). Correlation of blood groups and dominant finger prints with Openness to experience were also non-significant. Fingerprint is one of the oldest, reliable and mature biometric technologies and is considered one of the best, cheapest and legitimate proofs of identification [17]. An earlier study conducted in Libya supported our findings and showed majority of students contained blood group O which was followed by blood group A. It is worth mentioning that fingers showed high frequency of loops followed by whorls. Our findings were in agreement with an earlier report indicating loops to be observed in both genders in the left thumb print were 60% followed by whorls 27% [17-20].

Conclusion

The results of the present study demonstrated that there was no significant relationship among fingerprint patterns, blood group either in ABO system or in Rh system and personality.

We find the same order of predominance as recorded by other researchers.

The finger print pattern found was the same as shown for general population: Loop followed by Whorl and Arch. The most common blood group in our study was group B and Rh positive. The present study added support to the earlier investigations.

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