e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(2); 127-130

Original Research Article

Study of Fingerprint Characteristics in Association to Blood Types and Gender

Ashok Najan[1], Harsh Kumar Chawre[2], Sameer Sathe[3], Anil Mangeshkar[4*]

[1]Associate Professor, Dept of Forensic Medicine & Toxicology, NSC GMC, Khandwa (M.P.)

[2]Associate Professor, Dept. of Anatomy, GMC, Datia (M.P.)

[3]Professor and Head, Dept. of Anatomy, GMC, Datia (M.P.)

[4]Associate Professor, Dept of Forensic Medicine & Toxicology, GMC, Datia (M.P.)

Received: 13-11-2023 / Revised: 11-12-2023 / Accepted: 05-01-2024
Corresponding Author: Anil Mangeshkar
Conflict of interest: Nil

Abstract

Background- The Scientific study of naturally occurring epidermal ridges and their arrangement on the fingers, palms, and soles—aside from the flexion crease and secondary folds—is known as dermatoglyphics. A fingerprint can be used to identify a person since it has a distinctive pattern. A fingerprint is a slimy, oily imprint of the finger's friction ridges.

Objective- To determine the correlation if any exists between the fingerprint pattern and blood group and gender.

Methods- It was a cross-sectional study conducted on volunteered subjects who consented to participate in the study. A total of 250 individuals were enrolled in the study. The pupils were instructed to press each finger on the stamp pad, and their ten fingers' fingerprints were captured on white paper, which was handed over to the participants immediately after the on-the-spot analysis of the fingerprint pattern using a hand-held magnifying lens, there were four categories for the patterns notably loops, whorls, arches, and composite. Blood type and Rh status were also recorded, and the outcome was compiled and analyzed.

Results- The present study indicates that the incidence of blood group B was highest (44.8%) followed by A (27.2%), O (18.4%), and AB (9.6%) blood groups respectively. The incidence of loops was highest in males as compared to females. Similarly, the whorls pattern was found to be higher in males. Arches were higher in females. Whorls are also more common in the B blood group and this was found to be statistically significant ($p<0.05$).

Conclusion- Fingerprint patterns serve as distinctive features for individual identification. Their association with gender and blood group, as well as the awareness of the prevalence of different fingerprint patterns, can aid in identity prediction and authentication.

Keywords-Fingerprint, Dermatoglyphics, Loops, Whorls, ABO blood group

Introduction

Dermatoglyphics, also known as fingerprint/ dactylography, is a Greek word meaning "Derma" (skin) and "Glyph" (carve). The scientific study of naturally occurring epidermal ridges and their arrangement on the fingers, palms, and soles—aside from the flexion crease and secondary folds—is known as dermatoglyphics. Anatomist Harold Cummins first used the word in 1926. A fingerprint is the impression of a person's finger's friction ridges and can form on any opaque surface. [1] Two-fingerprint matching is one of the most used and dependable biometric methods. Fingerprint matching merely takes into account a fingerprint's visible characteristics [2].

One of the main goals of forensic inquiry is to identify a person based on their physical and mental traits. It entails researching pathological or physical, particular characteristics, whether they be mental or functional. Human identity is necessary for legal and socio-personal purposes. [3] A few examples of the data used for personal identification are bite marks, handwriting, iris and retinal prints, tattoo marks, anthropometry, dactylography, lip prints, blood grouping, DNA fingerprinting, stature determination, age and sex determination, and so on. A fingerprint can be used to identify a person since it has a distinctive pattern. A fingerprint is a slimy, oily imprint of the finger's friction ridges. The palmar or plantar surface as well as the epidermal layer of the finger digits' skin have elevated areas known as friction ridges. [4]

Many years ago, research on fingerprints and their use for personal identification was done in India. [4] The study of fingerprints is known as dermatoglyphics. According to many theories, a person's fingerprints are genetically predetermined and remain the same from birth until death. Previous investigations on dermatoglyphics have discovered a substantial correlation between blood types and fingerprint patterns. [5]

Karl Landsteiner, an Austrian scientist, discovered the ABO blood group system at Berlin University. When compared to other blood group systems, the ABO and Rh systems are very significant.11 Four primary forms of ABO are further distinguished: A, B, AB, and O. The ABO type is determined by two antigens and two antibodies. The Rh blood group is one of the most complicated blood types in humans. It can be further divided into Rh-positive and Rh-negative groups based on whether the D antigen is present or not. Certain blood groups are typically affected by certain diseases, such as the O blood group's duodenal ulcer and the A blood group's gastric ulcer. [6] The purpose of this study was to determine whether the human dermatoglyphic pattern and the ABO and Rh blood groups were correlated.

Materials and Methods

It was a cross-sectional study conducted on volunteered subjects who consented to participate in the study. A total of 250 individuals were enrolled in the study. Fingerprints, Blood type, and Rh status were also recorded, and the outcome was compiled and analyzed.

To analyze the finger print pattern of the participants they were instructed to press each finger on the stamp pad, and their ten fingers' fingerprints were captured on white paper, which was handed over to the participants immediately after the on spot analysis of the fingerprint pattern using a hand held magnifying lens, There were four categories for the patterns notably loops, whorls, arches, and composite. Blood type and Rh status were also recorded, and the outcome was compiled and analysed

Inclusion Criteria- Those participants who were aware of the blood group and gave consent.

Exclusion criteria- Individuals with damaged finger pulp as a result of trauma, disease or due to mehandi.

Statistical Analysis

Data analysis was conducted using SPSS Statistics version 22 (IBM Corporation, Armonk, New York). The data were analyzed using descriptive statistics. Categorical variables were expressed as numbers and percentages. Continuous variables were expressed as mean ± standard deviation if normally distributed and median with range if skewed. A p-value of <0.05 is considered statistically significant.

Results

Table 1: Distribution of students as per Blood Groups

Blood group	Number (%)
A	68 (27.2)
B	112 (44.8)
AB	24 (9.6)
O	46 (18.4)

As per table 1 incidence of blood group B was highest (44.8%) followed by A (27.2%), O (18.4%) and AB (9.6%) blood groups respectively.

Table 2: Fingerprint Pattern in study population

Pattern of fingerprint	Males	Females	Number
Loops	702	692	1394
Whorls	355	335	690
Arches	174	191	365
Composite	72	63	135

As per table 2 loops were the prominent finger pattern irrespective of the blood group and also the incidence of loops was highest in males as compared to females. In the analysis of sex-based differentiation, whorls were higher in males whereas Arches were higher in females.

Table 3: Frequency of Fingerprint pattern concerning Rh factor

Rh status	Loops	Whorls	Arches	Composite	p-value
Positive	1370	640	340	132	**0.01**
Negative	124	50	25	3	

As per table 3 the incidence of both loops and whorls is more in Rh-positive individuals which concludes that there is a steep skew in the incidence of Rh-positive individuals compared to negative and that loops are the most common type of fingerprint suggests that this study is statistically significant ($p<0.05$).

Table 4: **Frequency of Fingerprint pattern concerning ABO blood group**

ABO group	Loops	Whorls	Arches	Composite	p-value
A	400	190	115	30	**0.01**
B	560	270	120	60	
O	405	200	110	30	
AB	129	30	20	15	

As per table 4 individuals with B blood group have loop as the predominant fingerprint pattern. Whorls are also more common in B blood group and this was found to be statistically significant ($p<0.05$). This showed the rejection of the null hypothesis and revealed that there is an association between fingerprint patterns and blood groups.

Discussion-

A person's fingerprints play a vital role in establishing their identity and serve as an important tool in the field of forensics. It is one of the tools used to assist in establishing a person's identity for all forensic intents. Contrarily, blood types are innate traits that differ from person to person even though they are defined by the antigens on the surface of red blood cells. Finding links between these two aspects of an individual's identity is the goal of the current investigation. [6] According to the current study, blood group B had the highest occurrence, followed by blood groups O, A, and AB, in that order.

Few studies discovered that the O blood group had a greater occurrence. [7,8,9] These discrepancies may be explained by changes in the genetic composition of the research populations in the individual studies, which may also explain why the incidence of blood categories A and O was highest in a small number of studies. As compared to Rh-ve (10.5%), the current study showed a much higher occurrence of Rh+ve (90.5%) patients, which is consistent with previous research done by different researchers. [9,10]

Males had a higher incidence of loops (890) than females (607); research by few authors also revealed comparable findings. According to Baye's Theorem, the ridge pattern density is one of the characteristics that aids in gender discrimination; however, the incidence of a particular type of fingerprint may also be helpful. [11]

In all blood groups, loops were the most common type. Blood groups O, A, and AB had lower incidences of loops than blood group B. This is consistent with the findings of study which showed that blood group B had the highest incidence of loops. [12] Few research revealed that blood groups O and B had the highest and lowest incidences of loops, respectively, whereas a few researches demonstrated that blood group AB had the highest incidence rate. [13,14,15] In our study, blood group B had the highest incidence of whorls, while blood group AB had the lowest.

Our study has few limitations in determining whether there is a genetic relationship between blood groups and fingerprint patterns which was outside the purview of the current study. Further research is needed on this topic, as such genetic relationships have the potential to revolutionize the field of Forensic Medicine and shed light on more precise identification techniques that will have a wide range of effects on other fields.

Conclusions-

The results of this study showed that there is a substantial correlation between blood groups and fingerprint patterns. It also revealed that loops are the most common type of fingerprint and that they are more common in men than in women. It is necessary to conduct a thorough investigation into the relationship between blood types and fingerprint patterns, as this could lead to the discovery of more precise identification methods and potentially even genetic linkage.

References

1. Limson KS, Julian R. Computerized recording of the palatal rugae pattern and an evaluation of its application in forensic identification. J Forensic Odontostomatol. 2014;22(1):1–4.
2. Cummins H. Palmar and Plantar Epidermal Ridge Configuration [Dermatoglyphics] in Europeans and Americans. Am J Phys Anthrop. 2016;179:741–802.
3. Herschel WJ. Skin furrows of the hand. Nature . 2010;23(578):76.
4. Cummins H, Kennedy RW. Physiological Examination of visual organ and of the cutaneous system. Am J Crim Law. 2015;31:343–56.
5. Bharadwaja A, Saraswat PK, Aggarwal SK, Banerji P, Bharadwaja S. Pattern of fingerprints in different ABO blood groups. J Indian Acad Forensic Med. 2014;26(1):6–9.
6. Mehta AA, Mehta AA. Palmar dermatoglyphics in ABO, RH Blood groups. Int J Bill Med Res. 2011;2(4):961–4.

7. Kanchan T, Chattopadhyay S. Distribution of fingerprint patterns among medical students. J Indian Acad Forensic Med. 2016;28(2):65– 8.
8. Pillay VV. Textbook of forensic medicine and toxicology. 15th ed. Hyderabad: Paras Medical Publishers; 2019. p. 53–94.
9. Aird I, Bentall HH, Roberts JA. A relationship between cancer of stomach and the ABO blood groups. Br Med J.2018;1:799–801.
10. M, Bhujbal C, Shejul R, Sahoo M. Study of fingerprint patterns in relation to gender and blood groups. Int J Clin Biochem Res 2023 ;10 (2):149-153.
11. Gowda MS, Rao CP. A study to evaluate relationship between dermatoglyphic features and blood groups. J Ant Soc India. 2016;45:39.
12. Khalid M, Qureshi MA. Frequencies of blood group antigens and corresponding alleles in the population of Mirpur, Azad Jammu Kashmir, Pakistan. J Anim Planet Sci. 2016;16(3-4):96–8.
13. Ghasemi N, Ayatollahi J, Zadehrahmani M, Nasiri A, Abedi A, Shokraneh S, et al. Frequency of ABO and Rh blood groups in middle school students of Yazd province. Iran J Pediatr Hematol Oncol. 2010;1(1):27–30.
14. Rastogi P, Pillai KR. A study of fingerprints in relation to gender and blood group. J Indian Acad Forensic Med. 2010;32(1):11–4.
15. Sudikshya K, Maharjan N, Adhikari N, Shrestha P. Qualitative analysis of primary fingerprint pattern in different blood group and gender in Nepalese. Anat Res Int:. 2018;2018: 2848974.