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The Correlation of Thumbprint Patterns with Blood Group and Gender Among Students at Saint James School of Medicine

Ayesha Khalid[1*], Aadhya Chawla[1], Maryam Malik[1], Sara Alshahd[1], Laxman Reddy Nadithe[2], Paripelli, Sunitha[3], Sreenivasa Gadireddy[3], Namani Satyanarayana[3]

[1]MD-4 Students; Saint James School of Medicine, Arnos Vale, St. Vincent & the Grenadines.
[2]Assistant Professor, Saint James School of Medicine, Arnos Vale, St. Vincent & the Grenadines.
[3]Associate Professor, Saint James School of Medicine, Arnos Vale, St. Vincent & the Grenadines.

ABSTRACT: This study explores the relationship between thumbprint patterns, blood groups, and gender among students at Saint James School of Medicine. The primary aim is to examine whether specific thumbprint characteristics are associated with blood group types and whether these patterns differ between male and female students. A total of 60 participants (31 males and 29 females) were involved in this study. Thumbprint patterns were classified into loops, double loops, whorls, tentarchs, and arches using a standardized classification system. Blood groups were identified through serological testing. Statistical analyses, including chi-square tests, were used to examine potential associations between thumbprint patterns, blood groups, and gender. Preliminary results suggest notable variations in thumbprint patterns across different blood groups, with some patterns being more common in specific groups. Additionally, gender differences were identified, indicating that male and female students display distinct thumbprint characteristics. These findings contribute to the understanding of biometric traits and their potential connections to genetic factors, such as blood group and gender. Further research is recommended to investigate the genetic and environmental factors influencing thumbprint patterns.

KEYWORDS: Blood Group, Students, Thumbprint patterns.

INTRODUCTION

Dermatoglyphics is the scientific study of the unique patterns formed by epidermal ridges on the fingers, palms, and soles. The term was introduced by H. Cummins in 1926 and encompasses various fields, including anthropology, genetics, and ecology, with a focus on thumbprints[1] (Umraniya et al., 2013). These ridge patterns develop under the influence of the cornified layer of the epidermis and the underlying dermal papillae, with differentiation occurring during the third and fourth months of fetal development[2]. W.J. Herschel played a pivotal role in utilizing fingerprints for personal identification in India as early as 1880. Later, in 1892, Francis Galton classified fingerprints into three primary patterns: loops, whorls, and arches. Notably, the ridge patterns on fingertips are fully formed at birth and remain unchanged throughout an individual's life, except in cases of trauma or burns[3].

Studies have indicated significant variations in the frequency of papillary patterns and blood groups across different populations. Research by Bloterogel and Blutgrype (1934) examined the correlation between physical characteristics and blood types. This study aims to investigate the relationship between fingerprint patterns, gender, and blood groups, which could potentially enhance the role of fingerprints in forensic analysis[4]. Ultimately, dermatoglyphic evidence remains one of the most reliable forms of identification in legal contexts.

MATERIALS AND METHODS

The present study was conducted at Saint James School of Medicine during the 2023-2024 academic year. A total of 60 participants were randomly selected, comprising 31 males and 29 females, with ages ranging from 19 to 60 years. All participants were healthy, and their blood groups were already known. Informed consent was obtained from each individual prior to their inclusion in the study.

The study focused exclusively on analyzing thumbprints. Basic demographic information, including name, age, and gender, as well as the blood groups of all participants, were recorded. Individuals with scars or deformities on their thumbs were excluded from the study. Thumbprints were examined under a magnifying lens to identify primary fingerprint patterns, including loops, whorls, arches, and composites. The data were then organized and analyzed descriptively.

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RESULTS

Table 1: Distribution of cases according to Blood Group

Gender	A	B	AB	O	Total
Male	8 (13.3%)	6 (10%)	7 (11.7%)	10 (16.7%)	31 (51.7%)
Female	3 (5%)	6 (10%)	1 (1.7%)	19 (65.5%)	29 (48.3%)
Total	11 (18.3%)	12 (20%)	8 (13.3%)	29 (48.3%)	60 (100%)

Table 1 shows that a maximum 29 (48.3%) of the study subjects belong to O blood group whereas AB blood group contributes minimum 8 (13.3%) of the study subjects.

Table 2: Distribution of cases according to Rh Blood groups

Blood Group	Rh Positive	Rh Negative	Total
A	9 (15%)	1 (1.7%)	10 (16.7%)
B	10 (16.7%)	2 (3.3%)	12 (20%)
O	24 (40%)	6 (10%)	30 (50%)
AB	5 (8.3%)	3 (5%)	8 (13.3%)
Total	48 (80%)	12 (20%)	60 (100%)

Table 2 shows that maximum 48 (80%) of the study subjects belong to Rh positive group, out of which 24 (40%) belonged to blood group O, 10 (16.7%) of blood group B, 9 (15%) of blood group A and 5 (8.3%) belonged to AB positive blood group. Total Rh negative cases in this study were 12 (20%), out of which 6 (10%) each were of blood group O, 3(5%) belonged to blood group AB and 2 (3.3%%) of blood groups.

Table 3: General distribution of thumbprint patterns in both thumbs

Patterns of Thumbprint	Total	Percentage
Loops	62	51.7%
Whorls	42	35%
Arches	2	1.7%
Tencharch	4	3.3%
Double Loops	10	8.3%
Total	120	100%

Table 3 shows distribution of primary thumbprint patterns of all the fingers of both hands of all the subjects. Loops had the highest frequency 62 (51.7%) followed by whorls with 42 (35%), double loops with 10(8.3%), tencharch with 4 (3.3%), and arches showed the least number with 2 (1.7%).

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Table 4: Distribution of thumbprint pattern according to gender

Pattern of Thumbprint	Male	Female
Loops	33 (53.2%)	29 (50%)
Whorls	21 (33.9%)	21 (36.2%)
Arches	1 (1.6%)	1 (1.7%)
Tencharch	2 (3.2%)	2 (3.4%)
Double Loop	5 (8.1%)	5 (8.6%)
Total	62 (100%)	58 (100%)

Table 4 shows distribution of thumbprint patterns according to gender. Frequency of loops were found to be higher in females (50%) compared to that of males (53.2%). Whorls higher in females (36.2%) compared to males (33.9%) and arches, tentarches and double loops were the same in females and males.

Table 5: Thumbprint patterns among Rh+ve and Rh-ve blood groups

Pattern	Rh+ve	Rh-ve	Total
Loops	52 (43.3%)	10 (8.3%)	62 (51.7%)
Whorls	35 (29.2%)	9 (7.5%)	44 (36.7%)
Arches	1 (0.8%)	1 (0.8%)	2 (1.7%)
Tentrach	3 (2.5%)	1 (0.8%)	4 (3.3%)
Double Loop	6 (5%)	2 (1.7%)	8 (6.7%)
Total	97 (80.8%)	23 (19.2%)	120 (100%)

Table 5 shows distribution of thumbprint patterns among different blood groups with Rh factors. Loops had the highest frequency in all Rh positive and Rh-negative blood groups followed by whorls and double loops.

Table 6: Distribution of thumbprints based on Rh+ Blood groups

Pattern	O+	AB+	B+	A+	Total
Loops	23 (23.5%)	9 (9.2%)	6 (6.1%)	12 (12.2%)	50 (51%)
Whorls	21 (21.4%)	0 (0%)	12 (12.2%)	5 (5.1%)	38 (38.8%)
Arches	1 (1.0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.0%)
Tentarch	1 (1.0%)	0 (0%)	2 (2.0%)	0 (0%)	3 (3.1%)
Double Loop	0 (0%)	1 (1.0%)	2 (2.0%)	3 (3.0%)	6 (6.1%)
Total	46 (47%)	10 (10.2%)	22 (22%)	20 (20.4%)	98 (100%)

Table 6 shows that loops 50%, whorls 38.8%, double loops 6.1%, tentarch 3.1% and arches 1% of the study subjects belong to the Rh positive group. O positive blood group had the highest number of all the patterns among Rh positive blood groups.

Table 7: Distribution of thumbprints based on Rh-Blood groups

Pattern	O-	AB-	B-	A-	Total
Loops	4 (18.2%)	4 (18.2%)	2 (9.1%)	0 (0%)	10 (45.5%)
Whorls	6 (27.3%)	1 (4.5%)	0 (0%)	0 (0%)	7 (31.8%)
Arches	0 (0%)	0 (0%)	0 (0%)	1 (4.5%)	1 (4.5%)
Tentarch	0 (0%)	0 (0%)	0 (0%)	1 (4.5%)	1 (4.5%)
Double Loop	2 (9.1%)	1 (4.5%)	0 (0%)	0 (0%)	3 (13.6%)
Total	12 (54.5%)	6 (27.3%)	2 (9.1%)	2 (9.1%)	22 (100%)

Table 7 shows that loops 45.5%, whorls 31.8%, double loops 13.6%, arches 4.5% and tetarches 4.5% of the study subjects belong to Rh negative group. Among Rh negative, loops, whorls, and double loops were more in blood groups O and AB, arches are only present in B group. Tentarch were only noted in A group.

DISCUSSION

The study conducted by Chandrasekar et al. revealed that the general distribution of fingerprint patterns showed loops as the most common, accounting for 55.65% of the patterns, followed by whorls and arches. Regarding blood group distribution, the majority of participants (45.16%) had blood group O, followed by blood groups B, A, and AB, with 94.08% of participants being Rh-positive. The highest frequency of loops was observed in individuals with O-positive blood group, followed by those with B-positive blood group[5]. Manikanadan et al.'s study observed the distribution of fingertip patterns across both hands, revealing that loops were the most prevalent pattern, accounting for 40% (60 digits), followed by arches at 39% (58 digits), and whorls at 32% (21 digits)[6]. Bandameedi Lakshmi Narayana et al.'s research on the distribution of fingerprint patterns across different blood groups and Rh factors found that loops were the most common pattern in all Rh-positive and Rh-negative blood groups, except for A+ and O- blood groups, where whorls were more prevalent. In these cases, whorls were followed by arches. Among the Rh-positive blood groups, O+ exhibited the highest frequency of all fingerprint patterns. For Rh-negative blood groups, loops were most common in blood group A, while whorls and arches were more frequent in blood group O. Composite patterns were more prominent in the O+ blood group, followed by the B+ blood group[7].

The thumbprint patterns in this study adhered to the general trend, displaying whorls, arches, tentarchs, loops, and double loops, consistent with previous studies[8,9,10,11,12,13]. Blood groups O+ve, A+ve, and B+ve were the most common, as noted in earlier studies, while the rarest, A-ve, was found in only one participant[12,13,14]. The study also confirmed that Rh-positive individuals were more frequent than Rh-negative ones. Among both males and females, loops were the most prevalent pattern, followed by whorls, a result that differed from other research[8,12]. Loops were most common in the O+ve blood group, consistent with other studies, although some research has shown loops to be more frequent in the A group[8,9,10,11,12,13]. Whorls were predominantly observed in the O+ve group, followed by the B+ve group, aligning with other studies[9,11]. No whorls were found in A-ve and B-ve subjects. Arch and tentarch patterns were noted in O+ve and A-ve individuals. Double loops were absent in O+ve, B-ve, and A-ve subjects but were prevalent in A+ve individuals.

CONCLUSION

This study conducted at Saint James School of Medicine provides valuable insights into the relationship between thumbprint patterns, blood groups, and gender among the student population. The findings reveal distinct patterns, with loops being the most common

 *Corresponding Author: Ayesha Khalid

thumbprint type, followed by whorls, observed in both male and female participants. Loops were notably more frequent in individuals with the O+ blood group, while whorls were primarily seen in the B+ and O+ groups. Rh-positive individuals also exhibited a higher frequency of both loops and whorls, aligning with broader population trends. The observed variations in fingerprint patterns based on blood group and gender highlight potential genetic or developmental factors that warrant further exploration.

These results contribute to the broader field of dermatoglyphics and forensic science by enhancing the understanding of how thumbprint patterns may be influenced by genetic traits like blood type. Future studies with larger sample sizes and additional genetic and environmental variables could offer a deeper understanding of the role these factors play in thumbprint pattern development. Overall, this study underscores the potential of dermatoglyphic traits as non-invasive markers for genetic research and forensic identification.

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