SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Gope *et al*., 2026
doi: 10.21276/SSR-IIJLS.2026.12.3.34

Original Article

open access

Cross-Sectional Study of Fingerprint Patterns in Relation to Blood Group and Gender in a Tertiary Care Centre

Shauni Gope[1]*, Ashis Das[1], Santanu Das[1]

[1]Senior Resident, Dept of Forensic Medicine & Toxicology, Agartala Govt. Medical College and Hospital, Agartala, West Tripura, India

***Address for Correspondence:** Dr. Shauni Gope, Senior Resident, Dept of Forensic Medicine & Toxicology, Agartala Govt. Medical College and Hospital, Agartala, West Tripura, India
E-mail: shaunigope@gmail.com

Received: 02 Feb 2026/ Revised: 11 Mar 2026/ Accepted: 23 Apr 2026

ABSTRACT

Background: Fingerprints are unique, permanent, and widely used in forensic identification. Dermatoglyphics has been extensively studied for possible associations with biological traits such as ABO blood groups and gender; however, findings remain inconsistent across different populations, highlighting the need for further research. The present study was undertaken to evaluate the association between fingerprint patterns and ABO/Rh blood groups as well as gender in a tertiary care centre population.

Methods: A cross-sectional study was conducted among 200 participants attending a tertiary care centre. Fingerprints of all ten fingers were collected using the standard ink method and classified into loops, whorls, arches, and composite patterns. Blood group data (ABO and Rh) and gender were recorded. Statistical analysis was performed using the Chi-square test, and a p-value <0.05 was considered statistically significant.

Results: Loop pattern was the most common fingerprint type (55%), followed by whorls (35%), arches (7.5%), and composite patterns (2.5%). No statistically significant association was observed between fingerprint patterns and gender (p>0.05). However, a significant association was found between fingerprint patterns and ABO blood groups (p<0.05), with variation in distribution across A, B, O, and AB blood groups.

Conclusion: The study demonstrates a significant association between fingerprint patterns and ABO blood groups but not with gender. These findings suggest limited utility of dermatoglyphics in sex determination but potential forensic relevance in blood group prediction. Further multicentric studies with larger sample sizes are recommended to validate these associations in different populations.

Key-words: Dermatoglyphics, Fingerprint patterns, ABO blood group, Gender, identification

INTRODUCTION

Identification of individuals is a cornerstone of forensic medicine. Fingerprints, due to their permanence and individuality, remain one of the most reliable biometric tools. Even identical twins have distinct fingerprint patterns. [1] Dermatoglyphics, the scientific study of epidermal ridge patterns, has been extensively used in anthropology, genetics, and forensic science. [2]

How to cite this article
Gope S, Das A, Das S. Cross-Sectional Study of Fingerprint Patterns in Relation to Blood Group and Gender in a Tertiary Care Centre. SSR Inst Int J Life Sci., 2026; 12(3): 9928-9931.

Access this article online
https://iijls.com/

Fingerprints are formed during intrauterine life and remain unchanged throughout life, making them valuable for identification. [3]

In forensic investigations, only trace evidence, such as fingerprints or bloodstains, is often available. Hence, any correlation between fingerprint patterns and biological traits such as blood groups or gender could significantly enhance identification techniques. [4] Previous studies have explored associations between fingerprint patterns and ABO blood groups with varying results. Some studies have reported a statistically significant association between fingerprint patterns and ABO blood groups, while others found no such relationship. [5]

Similarly, studies assessing gender differences in fingerprint patterns have largely shown no significant

doi: 10.21276/SSR-IIJLS.2026.12.3.34

variation between males and females. [6] Given these inconsistent findings, further research is warranted, especially in the Indian population, to validate the relationship between dermatoglyphic patterns, blood groups, and gender.

In addition, fingerprint patterns have gained considerable importance in forensic investigations because of their permanence, uniqueness, and ease of collection. Since dermatoglyphic traits and blood groups are genetically determined during fetal life, researchers have attempted to establish possible associations between them. Several studies have suggested that understanding such relationships may help improve identification methods and assist forensic experts when only limited biological evidence is available. Therefore, evaluating the association of fingerprint patterns with blood groups

MATERIALS AND METHODS

Study Design and Setting- This was a descriptive, autopsy-based cross-sectional study conducted at Agartala Government Medical College (AGMC) & GBP Hospital, a tertiary care centre of Tripura. The institute is serving a large population and receives a significant number of medico-legal cases. The study was conducted over six months from August, 2025 to January, 2026.

Study Population and Sample Size- The study population comprised Individuals aged ≥18 years attending the institution during the study period. A total of 200 cases fulfilling the inclusion criteria were included in the study.

Inclusion Criteria- Individuals ≥18 years of age and willing to participate during the study period were included, irrespective of gender.

Exclusion Criteria- Individuals with finger deformities and skin diseases affecting fingertips were excluded from the study.

Data Collection Procedure- Fingerprints were obtained using the standard ink method, and all ten fingers were recorded on proforma sheets. Patterns were classified as: Loops, Whorls, Arches, and Composite. Blood group (ABO and Rh) and gender of the individuals were recorded.

Variables Studies- The variables analyzed in the study included fingerprint pattern, sex and blood groups of the study population.

Statistical Analysis- The collected data were compiled, coded and entered into Microsoft Excel and subsequently analysed using the Statistical Package for the Social Sciences (SPSS) software (Version 20/23). Descriptive statistics, including frequencies and percentages, were calculated. Inferential statistical analysis was performed using the Chi-square test to assess associations between variables and p-value <0.05 was considered statistically significant.

RESULTS

Table 1 shows distribution of fingerprint patterns among the individuals. Loops (55%) were the most common pattern, followed by Whorls (35%) and Arches (7.5%). Composite pattern is found among 2.5% cases.

Table 1: Distribution of Fingerprint Patterns

Pattern	Frequency	Percentage
Loops	110	55%
Whorls	70	35%
Arches	15	7.5%
Composite	5	2.5%

Table 2 shows the distribution of fingerprint patterns according to gender. In the male population, 54% were loops followed by Whorls (36%) and Arches (7%). In the female population, 56% were loops followed by whorls (34%) and Arches (8%). Chi-square p-value is >0.05, and there is no significant association with gender.

Table 2: Distribution by Gender

Pattern	Male (%)	Female (%)
Loops	54	56
Whorls	36	34
Arches	7	8

Table 3 shows the distribution of fingerprint patterns and blood groups. Among the fingerprints of 'A' blood group individuals, 50% were loop followed by Whorls (40%) and Arches (10%). Among the fingerprints of 'B' blood group individuals, 60% were loop followed by Whorls (30%) and Arches (10%). Among the fingerprints of 'O' blood group

doi: 10.21276/SSR-IIJLS.2026.12.3.34

individuals, 52% were loop followed by Whorls (40%) and Arches (8%). Among the fingerprints of 'AB' blood group individual, 48% were loop followed by Whorls (42%) and Arches (10%). Chi-square p-value is <0.05 and there is a significant association with ABO blood group.

Table 3: Distribution by ABO Blood Group

Blood Group	Loops (%)	Whorls (%)	Arches (%)
A	50	40	10
B	60	30	10
O	52	40	8
AB	48	42	10

DISCUSSION

The present study evaluated the relationship between fingerprint patterns, ABO blood groups, and gender among 200 participants attending a tertiary care centre. Dermatoglyphics has long been considered a valuable tool in forensic science because fingerprint patterns are unique, genetically determined, and remain unchanged throughout life. The current study demonstrated that loops were the predominant fingerprint pattern, followed by whorls and arches. A statistically significant association was observed between fingerprint patterns and ABO blood groups, whereas no significant association was found with gender. These findings support the potential role of dermatoglyphics in forensic identification and biological profiling.

In the present study, loops constituted 55% of all fingerprint patterns, making them the most common pattern, followed by whorls (35%) and arches (7.5%). Similar findings have been reported in Devi *et al.* [5] study, who conducted a study among medical students in Assam and observed loops as the predominant pattern, followed by whorls and arches. Likewise, Ranjan *et al*. [4] reported loops as the most frequent fingerprint pattern in their study population. The predominance of loop patterns may be attributed to genetic and developmental factors influencing ridge formation during embryogenesis. [8] The findings of the present study are therefore consistent with the general dermatoglyphic distribution observed in the Indian population. [9]

The analysis of fingerprint patterns according to gender in the present study revealed no statistically significant association between males and females (p>0.05). Loops were the commonest pattern in both sexes, accounting for 54% in males and 56% in females. Whorls and arches also showed nearly similar distributions among both genders. These observations are in agreement with the findings of Varlekar *et al.* [6], who similarly reported no significant sexual dimorphism in fingerprint patterns. Comparable results were also noted by studies conducted in different regions of India, where loops predominated in both sexes without statistically meaningful variation. [10] The absence of a significant gender association suggests that fingerprint patterns alone may not be reliable indicators for sex determination in forensic investigations. [11]

The present study demonstrated a statistically significant association between fingerprint patterns and ABO blood groups (p<0.05). Individuals with blood group B showed the highest prevalence of loop patterns (60%), whereas whorls were relatively more frequent among blood groups A and AB. These findings are comparable with studies conducted by Ranjan SK et al. and Devi *et al.* [4,5], both of whom reported significant correlations between dermatoglyphic patterns and ABO blood groups. Similar observations have also been documented in studies from different parts of India, where loops were predominantly associated with blood group B and whorls with blood group O or AB. Such associations may be explained by the genetic basis shared between fingerprint ridge formation and blood group inheritance during fetal development.

Manikandan *et al.* [7] emphasized the use of the ink method and classification into loops, whorls, and arches in dermatoglyphic studies. Across studies, loops are consistently reported as the predominant fingerprint pattern, followed by whorls and arches. The inconsistency in findings suggests the need for region-specific data to strengthen forensic applications.

The forensic importance of dermatoglyphics lies in its permanence, uniqueness, and ease of collection. In situations where only partial biological evidence is available, identification of a probable blood group through fingerprint analysis may assist forensic experts in narrowing down suspects or identifying unknown individuals.

The present study has certain limitations. The sample size was relatively small and confined to a single tertiary care centre, which may limit generalization of the

doi: 10.21276/SSR-IIJLS.2026.12.3.34

findings to the wider population. Rh blood group association was also not analysed separately in detail. Despite these limitations, the study adds valuable data to the existing Indian literature on dermatoglyphics and forensic identification.

CONCLUSIONS

Loops are the most common fingerprint pattern. No significant association with gender has been observed. Significant association with ABO blood groups are observed. These findings reinforce the potential utility of dermatoglyphics in forensic science and support the need for further large-scale studies in diverse populations. However, some previous studies have reported contradictory findings and failed to establish a statistically significant relationship between fingerprint patterns and blood groups. These variations may be due to differences in sample size, ethnicity, geographic distribution, or methodological variations in the classification of fingerprint patterns. India is a genetically diverse country, and dermatoglyphic variations may differ across populations. Therefore, multicentric studies with larger sample sizes are required to validate these associations further.

CONTRIBUTION OF AUTHORS

Research concept- Shauni Gope, Ashis Das, Santanu Das
Research design- Santanu Das
Supervision- Shauni Gope
Materials- Ashis Das
Data collection- Shauni Gope, Ashis Das, Santanu Das
Data analysis and interpretation Shauni Gope, Ashis Das
Literature search- Ashis Das, Santanu Das
Writing article- Shauni Gope, Ashis Das, Santanu Das
Critical review- Shauni Gope, Ashis Das, Santanu Das
Article editing- Shauni Gope, Ashis Das, Santanu Das
Final approval- Shauni Gope, Ashis Das, Santanu Das

REFERENCES

[1] Singh B. Role of finger print pattern in relationship with blood group and gender. J Med Sci Clin Res., 2016; 04(03); 9651-55.
[2] Cummins H, Midlo C. Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics. New York: Dover Publications; 1991. Available at: https://archive.org/details/in.ernet.dli.2015.143762.
[3] Kanchan T, Chattopadhyay S. Distribution of fingerprint patterns among medical students. J Indian Acad Forensic Med., 2006; 28(2): 65-68.
[4] Ranjan SK, Kumari P, Singh NK, Kumar A, Kumar S. Relation of Primary Fingerprint Patterns with Gender and Blood Group: A Dermatoglyphic Study from a Tertiary Care Institute in Bihar. European J Cardiovas. Med., 2025; 15: 293-99.
[5] Devi J, Nath P, Sarma SK, Medhi T, Kakoty SD. Study of Fingerprint Patterns in Relation to Different Blood Groups Among the Students of FAAMC Barpeta by Using 10 Finger Attributes. Int J Curr Pharm Rev Res., 2025; 17(1): 7-13.
[6] Varlekar MD, Varlekar B, Patel K. A study of relationship between blood type and fingerprint designs. European J Cardiovas. Med., 2024; 14: 206-11.
[7] Manikandan S, Devishamani L, Vijayakumar S, Palanisamy GS, Ponnusamy P, Jayakar SL. Dermatoglyphics and their relationship with blood group: An exploration. J Pharm Bioallied Sci., 2019; 11(Suppl 2): S285-88.
[8] Mehta AA, Mehta AA. Palmar dermatoglyphics in ABO, Rh blood groups. Int J Biol Med Res., 2011; 2(4): 961-64.
[9] Kshirsagar SV, Jadhav SD, Mhaske PV, Jadhav VS, Dighe NS. Study of fingerprint patterns in relation to gender and blood group. Indian J Forensic Community Med., 2015; 2(3): 146-50.
[10] Pratinidhi S, Lunawat V, Tilokchandani M, Bhujbal C, et al. Study of fingerprint patterns in relation to gender and blood groups. Int J Clin Biochem Res., 2023; 10(2): 149-53.
[11] Bharadwaja A, Saraswat PK, Agrawal SK, Banerji P, et al. Pattern of fingerprints in different ABO blood groups. J Forensic Med Toxicol., 2004; 21(2): 49-52.