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Dermatoglyphic patterns among medical students: A cross-sectional analytical study

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Abstract

Background: Dermatoglyphics is a scientifically validated tool for personal identification based on the uniqueness and permanence of epidermal ridge patterns.

Aim: To analyze the distribution of fingerprint patterns and assess gender-based differences among medical students.

Methods: This cross-sectional analytical study was conducted among 100 medical students (50 males and 50 females). Left thumb impressions were collected using the standard ink method and classified according to the Galton-Henry system. Statistical analysis was performed using chi-square test.

Results: Loop pattern was the most common (54%), followed by whorl (39%), arch (6%), and composite (1%). No statistically significant association was found between gender and fingerprint patterns ($\chi^2 = 2.13$, $p = 0.54$).

Conclusion: Loop pattern predominates in the study population, consistent with global dermatoglyphic trends.

Keywords: Dermatoglyphics; Fingerprints; Forensic Identification; Loop Pattern; Ridge Characteristics

1. Introduction

Dermatoglyphics, the scientific study of epidermal ridge patterns, plays a pivotal role in forensic identification due to the inherent uniqueness and lifelong stability of fingerprints. Since their formal classification under the Galton-Henry system, fingerprints have been extensively utilized in criminal investigations, biometric authentication, and medico-legal documentation. [1,2]

Fingerprint patterns are broadly categorized into loops, whorls, arches, and composite forms. Variations in these patterns have been attributed to genetic and environmental influences during embryonic development. Understanding their distribution in specific populations contributes to both forensic databases and anthropological insights. [3]

Recent studies have expanded the application of dermatoglyphics beyond identification to include prediction of dental and systemic conditions. [4]

Aim and Objectives

- To determine the distribution of fingerprint patterns among medical students.
- To evaluate gender-based differences in dermatoglyphic patterns.

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2. Materials and Methods

2.1. Study Design

Cross-sectional analytical study

2.2. Study Population

100 medical students (50 males, 50 females)

2.3. Sampling Method

Convenience sampling

2.4. Inclusion Criteria

- Willing participants
- No deformities affecting fingerprints

2.5. Exclusion Criteria

Finger injuries or dermatological conditions

2.6. Data Collection

Left thumb impressions were obtained using ink pad (plain method) on white paper. Prints were examined using a magnifying lens.

2.7. Classification

Patterns were classified as loop, whorl, arch, and composite using the **Galton-Henry system**.

2.8. Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Chi-square test was applied to assess association between gender and fingerprint pattern distribution. A p-value <0.05 was considered statistically significant.

3. Results

Table 1 Overall Distribution of Fingerprint Patterns

Pattern	Frequency (%)
Loop	54
Whorl	39
Arch	6
Composite	1

The study revealed that Loop(54%) was the most common pattern followed by Whorl(39%) and Arch(6%) and Composite pattern being the rarest with only 1% frequency.

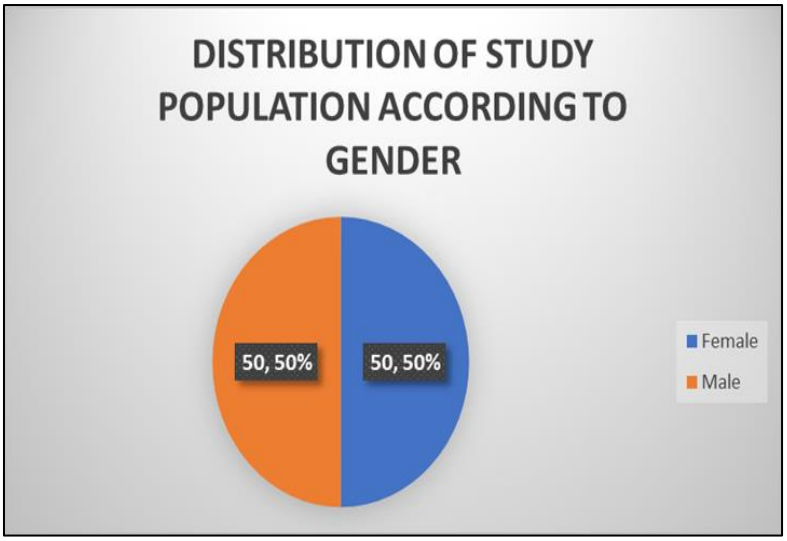

Figure 1 Distribution of Study based on Gender

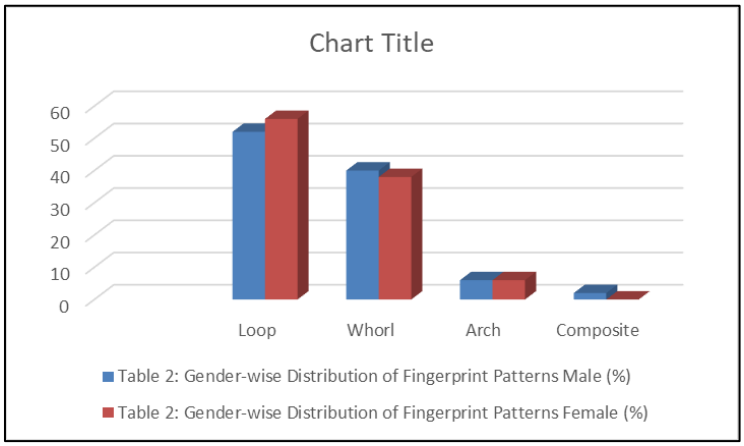

Figure 2 Gender wise distribution of finger print patterns

Loop was the predominant pattern in both genders. Statistical analysis revealed no significant association between gender and fingerprint pattern distribution ($\chi^2 = 2.13$, $p = 0.54$).

4. Discussion

The present study demonstrates that loop is the most prevalent fingerprint pattern among medical students, followed by whorl and arch patterns. These findings are in agreement with previous dermatoglyphic studies conducted across diverse populations, which consistently report loop as the dominant pattern. [3]

The absence of statistically significant gender variation suggests that fingerprint distribution is largely independent of sex in this population. Minor variations observed may be attributed to genetic predisposition and intrauterine environmental factors influencing ridge formation. [5]

Recent evidence suggests dermatoglyphics may have associations with clinical conditions such as dental caries and obesity, expanding its relevance beyond forensic identification. [4,6]Dermatoglyphics continues to be a reliable, non-invasive, and cost-effective tool in forensic science. Its application extends beyond identification to areas such as genetic studies and disease association research.

Future studies integrating dermatoglyphics with artificial intelligence and biometric analytics may further enhance its diagnostic and forensic applications.

5. Conclusion

Loop pattern is the most common dermatoglyphic pattern observed in this study population. No significant gender-based differences were identified. Dermatoglyphic analysis remains a valuable adjunct in forensic identification.

Strengths

- Equal gender distribution
- Simple, reproducible methodology

Limitations

- Small sample size
- Single-center study

Medicolegal Importance

- Personal identification
- Criminal investigation
- Biometric authentication
- Maintenance of official records

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Institutional ethical clearance was obtained.

Statement of informed consent

Informed consent was taken from all participants.

Author Contributions

All authors have equally contributed to study design, data collection, analysis, and manuscript preparation.

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