

■ ORIGINAL ARTICLE

Comparative Study of Bilateral Symmetry in Dermatoglyphic Patterns with reference to Geographical Parameters

Vaishali¹, G Rajesh Babu²

ABSTRACT

INTRODUCTION:

The personal identification is reliable tool for both legal and societal motives in forensic discipline. The utmost conventional manner of identification of individuals is based on the fingerprints. The present study has been carried out on 200 subjects, 100 males and 100 females of different age groups belonging to range from 18-55 years of Jammu and Kashmir and Gujarat population to compare the differences in bilateral symmetry in dermatoglyphic patterns along with frequency distribution of patterns with reference to the geographical locations. The research recommends that there are significant differences in bilateral symmetry and fingerprint patterns between males and females within the two populations and significant differences are observed between the two populations. The predominant fingerprint pattern was Ulnar loop, followed by Whorl in both Jammu and Kashmir and Gujarat state. Moreover, it was observed that maximum inhabitants have 80% of Bilateral Symmetry in (40%) of the two populations followed by 100% (26%) of both Jammu and Kashmir and Gujarat populations.

KEYWORDS | Fingerprints, Patterns, Bilateral Symmetry,

INTRODUCTION

Dermatoglyphics are the most reliable, distinctive and foremost significant tool used for personal identification purposes.¹¹ Fingerprints collected from the crime scene used for identification of culprits, suspects and victims. Digital fingerprint data can also be used to authenticate electronic enrolment, cashless transactions, access to enter in colleges and for office attendance. It is because of inimitability and infallibility property that is taken into consideration in forensic sciences to reinforce the criminal justice system and legal agencies. Since decades, fingerprints have been used to

solve several cases and were responsible for the punishment of the criminals.¹²

The study of friction ridge patterning on palmer and planter surfaces of palm of hands and soles of foot is called as Dermatoglyphics.¹ The term dermatoglyphics is derived from the Greek word, Derma means "Skin" and Glyphic means "Carving" was devised by the anatomist named Dr. Harold Cummins of Tulane University.^{5,9} The friction ridges formed on the inner surface of the hands and foot of the person constitute the dermatoglyphic pattern produced during early intra-uterine life, between the 7th

Author's Credentials:

¹Research Scholar, ²Associate Professor, Department of Forensic Science, School of Forensic Science, National Forensic Sciences University, Gandhinagar 382007, Gujarat, India.

Corresponding Author:

G Rajesh Babu, Associate Professor, Department of Forensic Science, School of Forensic Science, National Forensic Sciences University, Gandhinagar 382007, Gujarat, India.

Email: drrajeshbabu.babu@gmail.com

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and 21st week of gestation period.³ The fingerprints are formed due to the residue secretions from the sweat that is oozing out from the sweat pores present throughout the length of friction ridges.³ As there are three fundamental principles of fingerprints. Principle of Individuality, which states that fingerprints are unique and individual characteristics, even the two identical twins will not have the same fingerprint.⁴ The principle of Persistence means fingerprints remains unchanged throughout the lifetime of an individual. Principle of Variety, which states that fingerprint have general characteristics ridge pattern, which is helpful to systemically, classified the fingerprint and is the reliable benchmark for identification purposes.¹⁰ Muralidhar Reddy Sangam et al. observed in their study that loops were the most common pattern (56.3%), followed by whorls (39.5%) and arches (4.2%) respectively.⁶ Similarly, Nitin et al. observed the most occurring fingerprint pattern was Loop.⁸

In the present study, fingerprints pattern of 200 normal Gujarati population and Jammu Population of different age groups in the ranges of 18-55 years were analysed for bilateral symmetry for both males and females. This research was predominantly engrossed to study the bilateral differences in the occurrence of pattern types of analogous fingers in the hands. There have been numerous studies that have been done in the study of bilateral symmetry with respect to mental conditions.⁷ However, hardly there has been any study, which has been done on the Jammu population, nor there is any workquoting the association of the same. Therefore, this study was performed to determine predominant fingerprint patterns in males and females in relation to Jammu and Gujarati populations and to compare the fingerprint patterns between these populations.

MATERIAL AND METHODS

Subjects

The total sample mass consisted of 2000 fingerprints samples collected from 200 subjects, belonging to different districts of

Jammu Province, (J&K) comprising of 100 (50 male and 50 female) subjects born and raised in Jammu and 100 (50 male and 50 female) subjects, who are born and brought up in Gujarat, from age group of 18-55 years. The procedure and the purpose of research was described to the subjects and an informed consent was taken collectively from them before taking the finger impressions on 10-digit slips, and The research design and methodology were approved by the Ethics Committee of National Forensic Sciences University to carry out the research. Individuals with any malformations or disfigured fingers were precluded from the study.¹²

Recording the finger prints

The materials used were fingerprint inkpad, 10-digit Fingerprint slip, magnifying lens and Proscope: A handheld USB digital microscope as shown in Figure 1.



Fig. 1: ProScope

Each subject was asked to wash their hands thoroughly and then asked to roll their first distal phalange of fingers on the inkpad from one side of the nail to the other and then roll the inked finger to transfer the impression on the 10-digit Fingerprint slip.² The similar method was reiterated for all the fingers of both hands. In this way, fingerprints of all the ten digits were recorded as shown in Figure 2.

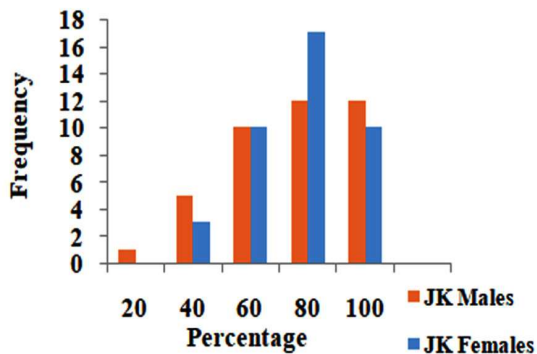


Fig. 2: Fingerprint Slip

The fingerprint patterns were identified as Arches, Loops and Whorls. The necessary information of the subject i.e. name, age, sex, address, and occupation is also documented at the end of the fingerprint slips.² The data were evaluated statistically and Descriptive statistics were used to recapitulate the data.² The frequency distributions of fingerprint patterns of both the Jammu and Kashmir and Gujarati populations were evaluated and compared.

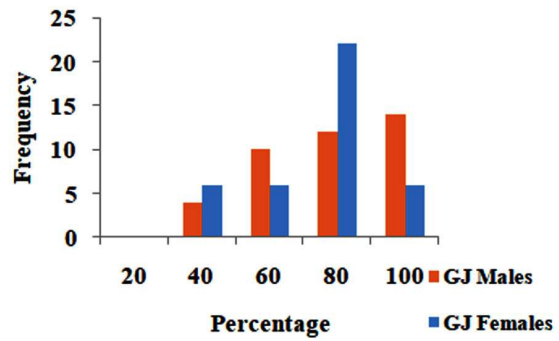
RESULTS AND DISCUSSIONS

Frequency of Bilateral Symmetry in JK Males & JK Females



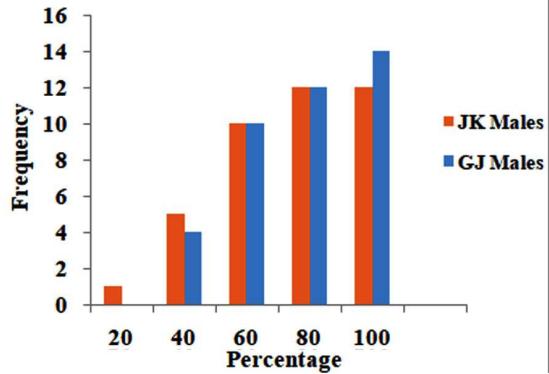
Graph 1: Refers the Differences in Bilateral symmetry in JK males and females.

Frequency of Bilateral Symmetry in GJ Males & GJ Females



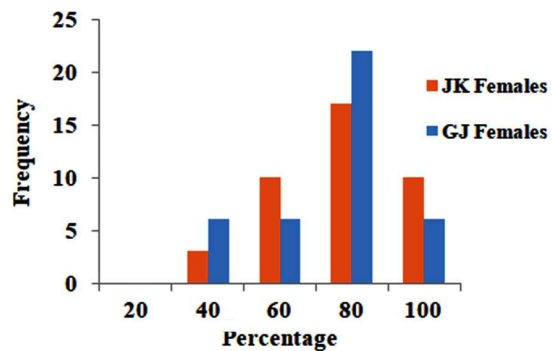
Graph 2: Refers the Differences in Bilateral symmetry in Gujarat males and females.

Frequency of Bilateral Symmetry in JK & GJ Males



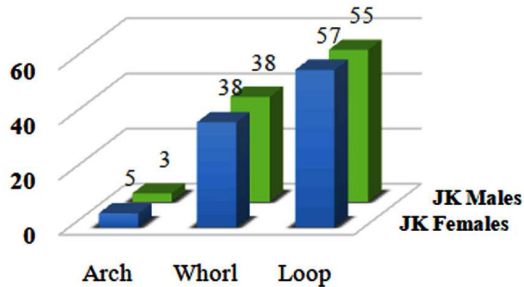
Graph 3: Refers the Differences in Bilateral symmetry in Jammu and Gujarat males.

Frequency of Bilateral Symmetry in JK & GJ Females



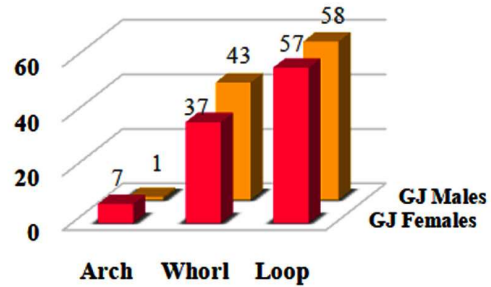
Graph 4: Refers the Differences in Bilateral symmetry in Jammu and Gujarat females.

Frequency of pattern distribution in Jammu & Kashmir Males and Females



Graph 5: Refers the frequency distribution of Fingerprint Patterns in JK males and females.

Frequency of pattern distribution in Gujarat Males & Females



Graph 6: Refers the frequency distribution of Fingerprint Patterns in Gujarat males and females.

Frequency of pattern distribution in JK & GJ Males

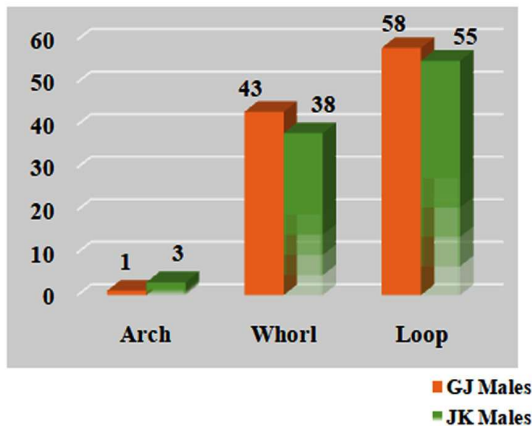


Table 7: Refers the frequency distribution of Fingerprint Patterns in Jammu and Gujarat males.

The significant differences seen between the gender with respect to the pattern, in which strong positive correlation was noticed with the whorl and loop patterns among Jammu and Kashmir population genders whereas, insignificant differences was seen in arch pattern with a positive yet weak correlation. Moreover, the study on Gujarat population depicted that the significant differences is seen along with strong positive correlation was noticed with the whorl patterns, medium positive correlation was noticed with the loop patterns, while negative yet weak correlation was visible in the arch pattern.

J&K male population had 59% of loop pattern, followed by whorls and arches, which were

Frequency of pattern distribution In JK & GJ Females

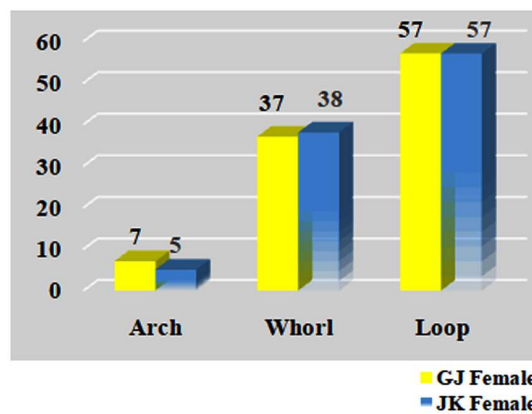


Table 8: Refers the frequency distribution of Fingerprint Patterns in Jammu and Gujarat females.

for 38% and 3% respectively. Similarly, J & K female population had 57% loops, followed by whorl and arch patterns for 38% and 5% respectively. Gujarat male population had 58% of loop patterns, followed by 43% of whorl and 1% of arch patterns, coincidentally similar results were seen in the Gujarat female population which had 57% of loop pattern, followed by whorl and arch patterns for 37% and 7% respectively.

Equivalently, significant differences was also seen Bilateral Symmetry of Fingerprint Patterns with respect to geographical areas of Jammu and Kashmir state and Gujarat state in which strong positive correlation was noticed. Furthermore, it was perceived that maximum

occupants have 80% of Bilateral Symmetry followed by 100% and 60% in both Jammu and Kashmir and Gujarat populations. The index finger followed by middle finger, ring finger, thumb and then little finger shows asymmetry in fingerprint patterns in J&K population whereas in Gujarat population, thumb is followed by index finger, middle finger, little finger, and then ring finger shows asymmetry in fingerprint patterns.

CONCLUSION

In the present study, it is observed that 80% is the not able bilateral symmetry found in Jammu and Kashmir, and Gujarat followed by 100% bilateral symmetry in dermatoglyphic patterns. The least is 20% bilateral symmetry is seen in (1.66%) of Jammu and Kashmir population whereas least is the 40% bilateral symmetry is seen in (10%) of Gujarat population. The significant differences in the frequency distribution of dermatoglyphic patterns between the two populations is also observed. The predominant fingerprint

pattern was Ulnar loop, followed by Whorl in both Jammu and Kashmir and Gujarat state. The after effects of this study are empowering, would help forensic fingerprint professionals for an identification purposes and helpful in constricting down the investigation involving bulk of records which led to the acceptance of fingerprints as a proficient method of identification. Further, extended research on different populations with additional parameters is in progress.

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Conflict of Interest:

The authors declare no conflicts of interest.

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