A Comparison Study on Ridge Density Among Males and Females in North Chennai

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ABSTRACT

The number of friction ridges per unit area of a fingerprint, or Fingerprint Ridge Density (FPRD), is a useful biometric marker that is frequently employed in anthropological and forensic studies. Because males and females have known biologically different ridge patterns, it is important for individual identification and can help with gender differentiation. Generally speaking, females have higher ridge densities than males because their ridges are finer and more closely spaced. The purpose of this study is to examine the differences in ridge density between males and females residents of North Chennai, Tamil Nadu, India. A total of 100 participants, ages 20 to 50, were chosen at random (50 men and 50 women). A magnifying lens and transparent ruler were used to measure the ridge density within a 25mm² radius of the index finger after fingerprints were gathered using the inkless paper method. The mean, range, and standard deviation for each group were assessed using descriptive statistical analysis. According to the results, the average ridge density for males was 13.36, with a range of 8 to 17, while the average for females was 12.88, with a range of 10 to 19. Both groups showed similar variability, with standard deviations of 1.88 (for males) and 1.83 (for females), despite minor variations in average values. Males had a normal distribution, according to histogram and bar chart analysis, while females had a slight right skew because of higher ridge counts in some situations.

KEYWORDS: Fingerprint Ridge Density, Comparison, North Chennai, Fingerprint.

I.INTRODUCTION

In forensic science, one of the most popular and dependable biometric methods for identifying people is fingerprint analysis, sometimes referred to as dactylography. Fingerprints are crucial to personal identification, criminal investigations, and even gender estimation because of their permanence, individuality, and uniqueness. The Fingerprint Ridge Density (FPRD), which is a measurable parameter in fingerprint analysis, is the number of ridges in a specific area, usually measured in a 25 mm² region. Each person's FPRD is unique, and variables like sex, age, and ethnicity can have an impact. Males typically have coarser and wider ridge patterns, which results in a lower count within the same area, while females typically have a higher ridge density than males, mainly because of their finer and narrower ridge patterns, according to numerous studies. This difference offers a possible foundation for gender differentiation, which can be useful in forensic investigations, particularly when partial fingerprints or unidentified remains are involved. The majority of forensic applications use ridge density as an additional parameter that, when combined with other biometric indicators, can improve identification accuracy rather than as a stand-alone technique for determining sex. Studies from different parts of India have confirmed that there are detectable sex differences in ridge density, although regional variances may limit the generalizability of these findings. This study aims to assess and compare the patterns of ridge density between males and females in North Chennai, a population for which there is currently little data. The objective of this study is to ascertain whether there is a statistically significant difference in ridge density between genders in this area by examining the fingerprints of 100 people (50 men and 50 women) between the ages of 20 and 50. If so, this analysis may be useful for forensic or anthropological applications in the future.

II. MATERIALS AND METHODS

An inkless fingerprint pad for clear and clean imprints, a magnifying lens for close inspection, a transparent ruler for precise ridge counting, and plain paper for recording the prints were among the supplies used for fingerprint collecting and analysis.

A total of 100 people, 50 men and 50 women, between the ages of 20 and 50, who lived in the North Chennai area, had their fingerprints taken for this study. To provide a balanced representation of the population, the participants were chosen at random.

Primary Data: Fingerprint collection.

Qualitative Data: Collection of Fingerprint and Comparison.

Descriptive Statistics Method:

Ridge density data is made easier to understand and compare between groups with the use of descriptive statistics. Ridge density can differ by sex, age, or race and is commonly expressed as ridges per 25 mm². In order to find trends and contrasts, metrics such as the mean and median display the average ridge density within each group. The mode can also emphasize values that occur often, however this is less usual. Finding out if one group generally has a greater or lower ridge density than another is made easier by these summary.

III. RESULTS AND DISCUSSION

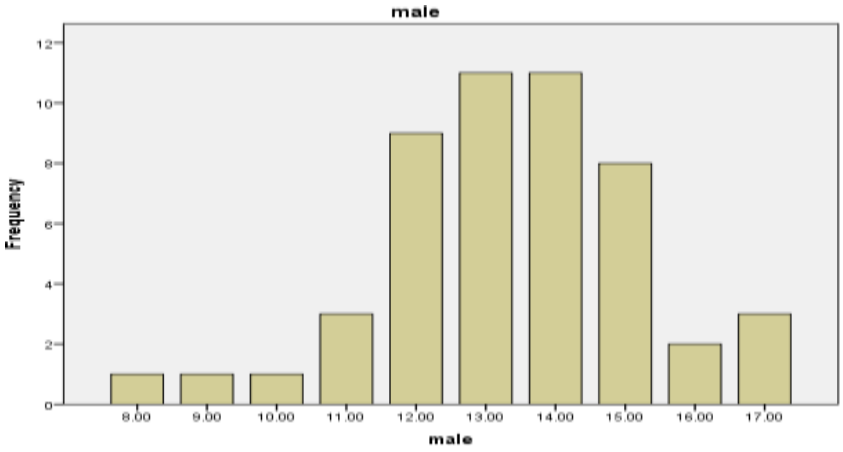
Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
male	50	8.00	17.00	13.3600	1.88181
female	50	10.00	19.00	12.8800	1.82544

Table 1 with 50 men and 50 females' ridge densities. Female scores fall between 10.00 and 19.00, whereas male levels fall between 8.00 and 17.00. The mean ridge density in males is somewhat greater (13.36) than in females (12.88), while the variability is comparable (standard deviations of 1.88 and 1.83, respectively).

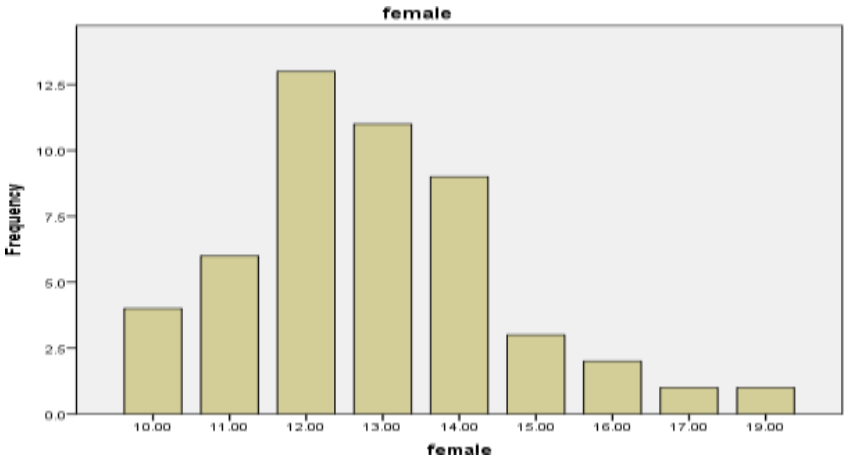
BAR CHART:

Chart 1: Frequency Test for Males



It indicates that the majority of males have medium ridge density, with extreme values (8–10 or 16–17) being uncommon and peak frequencies at 11–12 instances, indicating a generally normal distribution.

Chat 2: Frequency Test for Female



It indicates that the largest frequency of female ridge density occurs at 12, with the majority falling between 12 and 14. The upper range (15–19) has a little right-skew, with fewer examples. It would appear from this that the majority of females had normal ridge densities, however some had larger numbers.

The examination of 100 fingerprints from 50 men and 50 women in North Chennai showed modest but distinct variations in ridge density by gender. The mean for males was somewhat higher (13.36) than that of females (12.88), while the variability was comparable. Because they had higher ridge values (15–19), females had a small right-skew, whereas men had more lower values (8–10). Bar charts verified that the majority of the data for both groups were grouped around 13 and 14. The trends confirm earlier observations that females often have denser ridges, even if ranges overlapped. These findings serve as a foundation for additional statistical examination.

IV. CONCLUSION

This study supports the use of fingerprint ridge density as an additional forensic technique for gender identification. While females had greater scores in the upper range, men displayed more lower ridge values. When paired with additional biometric information, these patterns can help with identification even if they are not definitive on their own.

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