



Distribution of Fingerprint Patterns among First Year Medical Students in SKIMS medical college

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ABSTRACT

INTRODUCTION: Fingerprints are one of the most mature biometric technologies and are considered legitimate proofs of evidence in courts of law for human identification all over the world as they are constant and individualistic. **AIM:** There is relatively less research has been done in this field. Hence, the present study was done to see the pattern of fingerprints among first year medical students. **METHODS:** Study was carried out among 100 first year medical students (50 male & 50 female) belonging to the age group 17-24 years of SKIMS medical college bemina. Fingerprints of the fingertips were taken using the ink method. Distribution of fingerprint patterns were studied in both hands among males and females and compared.

RESULTS: Each finger print is unique; loops are the most commonly occurring fingerprint pattern while arches are the least common. Frequency of whorls is comparatively higher and that of loops lower. **CONCLUSION:** Thus while different patterns show preferences for different digits, bilateral

KEYWORDS : Dermatoglyphics, Fingertip patterns, Identification

Introduction:

Dermatoglyphics have been analyzed since ancient times, but it was identification of an individual from fingerprints that brought a revolution in the field of crime investigation. A Fingerprint is an impression of friction skin ridges, known as dermal ridges or dermal papillae. The study of epidermal ridge pattern on fingers, palm, and soles is known as "Dermatoglyphics". The first everwork for dermatoglyphics was done 3000 years ago in china. Harold Cummins first coined the word in 1926. (1)The dermatoglyphic pattern makes their appearance as early as 10 weeks of intrauterine life (2) The original ridge characteristics are not disturbed unless the skin is damaged to a depth of about 1 mm (1). Dermatoglyphics print remains ubiquitous throughout life and form the most reliable criteria of identification. Development of ridges was found to be affected by genetic and environmental factors.

Once formed these pattern do not change throughout one's life, (3) The fact that skin of palm and soles has ridges that are unique to each individual has been used for personal identification. (4) Study of fingerprint patterns is considered to be the most reliable and absolute method of identification. Galton classified different fingerprint patterns on the basis of their primary pattern as loops, whorls and arches. (5) The distribution of these Galton type fingerprint patterns is said to vary in different population groups, and association of fingerprint patterns with diseases of genetic origin has been reported in the past. (6, 7) Although average distribution of different fingerprint patterns is known worldwide (8), published literature on the distribution of fingerprint patterns on individual digits are very few.

Loops are the patterns that start from one side, move towards the centre, curve backwards and terminate on the same side. Whorls are circular or spiral arrangement of ridges in the centre, and in Arches, the ridge lines start from one side and end at the opposite end. Double loops and central pocket loops are classified under whorls. Although worldwide average distribution of different fingerprint patterns is known, (8) there is paucity of published literature on the distribution

of fingerprint patterns on individual digits.

The aim of the study was to study the distribution of fingerprint patterns on different digits in males and female medical students and to find if any variation occur between both sexes for both hands.

Material and Methods

The study was conducted in anatomy department at SKIMS medical college bemina. The material consisted of rolled fingerprints of 100 first year medical students, of which 50 were males and 50 females. The age group of the medical students ranged from 17 to 24 years. All healthy individuals with no history of any genetic disorders were included in the study. Written informed consent was taken from the study subjects. Dermatoglyphic prints were taken by using Ink Method by "Cummins and Midlo" (1). Ink method as described by Cummins and Midlo, which requires ink slab, inverted 'T' shaped pad, Kores duplicating ink, white paper, magnifying lens and soap was used. The ink was placed on the ink slab and the inverted 'T' shaped pad was soaked in it. The ink was evenly spread on the ink slab. Hands were thoroughly washed with soap before taking prints. The fingers were rolled laterally on the ink slab and then placed on a white paper with one lateral edge and rolled over in opposite direction. Finger tip patterns of all the digits were recorded and studied with the help of magnifying lens. Parameters observed were loops, whorls, arches. The printed sheets were coded with name, age, sex, address.

Finger print patterns were identified as: Loops, Whorls and Arches based on appearance of ridge lines. The present study evaluates the distribution of dermatoglyphic fingertip patterns in both hands among males and female first year medical students and the findings of the study are compared with the available data

Results:

A total of 100 fingerprint patterns were studied. Loops were the most common pattern followed by whorls and arches in both hands

among males and females. While loops were seen on all the digits , predominance of whorls was evident on thumb,index and ring fingers.Percentage of Pattern of finger prints seen in our study were as ,loops(57.6%),whorls(30.3%) & arches (7.4%) .Frequency of Loops were predominantly found on middle finger 147 (25.52%) followed by little finger 136 (23.6%) ,thumb 104(18.05%),ring finger 98 (17.01%) . Frequency of whorls was maximum on the index finger (27.72%) followed by thumb (25.08%) and ring finger (24.75 %). 48.64% of the total arches were present on the thumb & middle finger . There was insignificant difference in overall distribution of fingerprint pattern in both hands among males and females. Frequency of different fingerprint patterns for individual digits in both hands among males and females is shown in tables 1,2 &3

Table 1: General distributions of primary fingerprint patterns in all fingers of both hands

| Pattern of finger print | Number (%) |
|-------------------------|------------|
| loops | 576(57.6%) |
| whorls | 303(30.3%) |
| arches | 74(7.4%) |
| total | 1000(100%) |

Table 2: Distribution of whorls, loops and arches among males and females.

| DIGIT | SEX | LOOP | WHORL | ARCH |
|-----------------------|--------|----------|----------|---------|
| THUMB (n=100) | Male | 46(46%) | 48 (48%) | 6(6%) |
| | female | 58(58%) | 28 (28%) | 12(12%) |
| INDEX FINGER (n=100) | male | 35(35%) | 43 (43%) | 7(7%) |
| | female | 56(56%) | 41 (41%) | 5 (5%) |
| MIDDLE FINGER (n=100) | male | 60 (60%) | 23 (23%) | 10(10%) |
| | female | 87 (87%) | 10 (10%) | 8(8%) |
| RING FINGER (n=100) | male | 46(46%) | 30 (30%) | 10(10%) |
| | female | 52 (52%) | 45 (45%) | 2(2%) |
| LITTLE FINGER (n=100) | male | 51 (51%) | 16 (16%) | 5(5%) |
| | female | 85 (85%) | 19 (19%) | 9 (9%) |

Table 3: Distribution of Fingerprint Patterns viz-a-viz digits

| DIGIT | n | LOOPS | WHORLS | ARCHES |
|---------------|------|-------------|-------------|-----------|
| THUMB | 200 | 104(52%) | 76(38%) | 18(9%) |
| INDEX FINGER | 200 | 91 (45.5%) | 84(42%) | 12(6%) |
| MIDDLE FINGER | 200 | 147 (73.5%) | 33 (16.5%) | 18 (9%) |
| RING FINGER | 200 | 98 (49%) | 75 (37.5%) | 12(6%) |
| LITTLE FINGER | 200 | 136 (68%) | 35 (17.5%) | 14 (7%) |
| TOTAL | 1000 | 576 (57.6%) | 303 (30.3%) | 74 (7.4%) |

Discussion:

The ridge pattern in a fingerprint is genetically determined and highly individualistic. It remain ubiquitous throughout one's life. Worldwide percentage distribution of loops, whorls, arches and composite is approximately 65%, 25%, 7% and 2-3% respectively. (8) Thus highest percentages of fingerprint patterns were formed by loops followed by whorls and then arches. Similar percentages of various fingerprint patterns were found in the present study among medical students which coincides with most of the previous studies conducted (9,10). Although loops were the predominant patterns followed by whorls and arches in our study which is similar to the worldwide average but a study comprising British individuals observed frequency of whorls was higher and that of loops lower. (11).However, in our study ,the percentage of loops are relatively towards lower side compare to worldwide average while as the whorls are relatively towards higher side. Frequency of arches in our study was higher to worldwide average. Overall preponderance of loops among medical students in our study is in accordance with that reported in other studies involving medical students. (9, 12)Frequency of loops and whorls in our study was higher and that of arches lower when compared to study done at Ajmer. (12) In our study viz-a viz variation of fingerprint pattern among individual fingers ,few arches were reported in ring finger of female medical students.This observation is partly in line with obser-

vations seen in Nellimarla where no arches were reported in any of the fingers of the medical students.(9) . The overall distribution of different fingerprint patterns however was not significantly different between hands and no statistically significant gender differences could be established, similar to a study done on indigenous black Zimbabweans. (13) However, frequency of loops among Zimbabweans was significantly higher when compared to other studies.

Conclusion:

From our study, following conclusions can be drawn:

1. Frequency distribution of fingerprint patterns among Medical students differs from other population groups.
2. Frequency of whorls is comparatively higher and that of loops lower.
3. Distribution of fingerprint patterns was similar on both hands for both sexes. Thus while different patterns show preferences for different digits, bilateral variations in the Distribution of fingerprint patterns do not occur. Similar studies in other population groups are desirable for better correlation.

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