

A Study to Assess Fingerprint Pattern Among Medical Students at a Tertiary Care Centre in Western Rajasthan

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Abstract

Background: A fingerprint is an impression left by the friction ridges of a human finger. The recovery of partial fingerprints from a crime scene is an important method of forensic science. The present study was conducted to assess fingerprint pattern among medical students. **Material and methods:** A cross-sectional study was done among 240 students consisted of 120 males and 120 females. All the subjects were healthy, and their age ranged from 17 to 22 years. Fingerprints were taken by using Ink Method. The fingertip patterns of all the digits were recorded. The prints were analyzed with the help of the magnifying glass. The data was also analyzed for any abnormal new pattern particular to the study group. The frequency of each fingerprint pattern was tabulated, and the percentage of each pattern was calculated. **Results:** The rolled fingerprints of all ten fingers of 240 subjects were collected. Hence a total of 2400 fingerprints were obtained, which were analysed, and their patterns and subtypes were determined. Distribution of different patterns of fingerprints showed that prevalence of loop pattern (53.75%) was more in the medical students. In the loop pattern Ulnar subtype (92.24%) was predominant, in whorl type spiral subtype (52.28%) was predominant, in the composite pattern Twinned loop (42.53%) was predominant and in the arch pattern plain subtype (77.77%) was predominant. **Conclusion:** The present study concluded that loop pattern fingerprints were predominant in medical students. In the loop pattern Ulnar subtype was predominant, in whorl type spiral subtype was predominant, in the composite pattern Twinned loop was predominant and in the arch pattern plain subtype was predominant.

Keywords: Fingerprints, Loop Pattern, Composite Pattern, Arch Pattern, Whorl Pattern.

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Introduction

The study of epidermalridge pattern on fingers, palm, and soles known as "Dermatoglyphics". The first ever work for dermatoglyphics was done 3000 years ago in China. Harold Cummins first coined the word in 1926. The original ridge characteristics are not disturbed unless the skin is damaged to a depth of about 1 mm [1]. Development of ridges was found to be affected by genetic and environmental factors. Once formed these patterns do not change throughout one's life [2]. The dermatoglyphic science is based on two major facts; first, the ridges are slightly different for different fingers and no two persons, not even monozygotic twins, show exactly similar fingerprint patterns, and second, the ridges are permanent throughout life and they survive superficial injuries and environmental changes after the 21st week intra-uterine life. Fingerprint patterns of dermal ridges can be classified into three major groups: Arches, Loops, and whorls [3]. Herschel first demonstrated that his own impressions taken when aged 28 and again at 82 were unchanged except for the addition of coarse lines due to old age [4]. Any kind of injuries, old age, diseases etc. will not change the formation of patterns and ridge

characteristics, unless the skin is damaged to a depth of about 1 mm [5]. In the Henry Classification System there are three basic fingerprint patterns: loop, whorl, and arch, which constitute 60–65 percent, 30–35 percent, and 5 percent of all fingerprints respectively. There are also more complex classification systems that break down patterns even further, into plain arches or tented arches [6], and into loops that may be radial or ulnar, depending on the side of the hand toward which the tail points. Ulnar loops start on the pinky-side of the finger, the side closer to the ulna, the lower arm bone. Radial loops start on the thumb-side of the finger, the side closer to the radius. Whorls may also have sub-group classifications including plain whorls, accidental whorls, double loop whorls, peacock's eye, composite, and central pocket loop whorls [6,7]. The present study was conducted to assess fingerprint pattern among medical students.

Materials and Methods

A cross-sectional study was done among 240 students. All the subjects were healthy, and their age ranged from 17 to 22 years. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the participant after explaining the study. The subjects with any evidence of injury of fingertips that can lead to change in the fingerprint pattern were excluded from the study. Participants were asked to relax and co-operate to achieve the required movement of the fingers. Fingerprints were taken by using Ink Method by

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"Cummins and Midlo". The ink was placed on the ink slab and the pad was soaked in it. The ink was evenly spread on the ink slab by roller. The subjects were asked to wash and dry their hands. The printed sheets coded with name, age, sex, address was distributed. The fingers were rolled laterally on the ink slab and then placed on a white paper. The thumb was placed with the ulnar edge downward and rolled toward the body, and other digits were placed with the radial edge downward and rolled away from the body. The fingertip patterns of all the digits were recorded. The fingers were cleaned after taking the prints. The prints were analyzed with the help of the magnifying glass. The following parameters were studied and analyzed: Loops, Whorls, Composite, Arches and their subtypes. The data was also analyzed for any abnormal new pattern particular to the

study group. The frequency of each fingerprint pattern was tabulated, and the percentage of each pattern was calculated.

Results

The rolled fingerprints of all ten fingers of 240 subjects were collected. Hence a total of 2400 fingerprints were obtained, which were analysed, and their patterns and subtypes were determined. Distribution of different patterns of fingerprints showed that prevalence of loop pattern (53.75%) was more in the medical students. In the loop pattern Ulnar subtype (92.24%) was predominant, in whorl type spiral subtype (52.28%) was predominant, in the composite pattern Twinned loop (42.53%) was predominant and in the arch pattern plain subtype (77.77%) was predominant.

Table 1: Distribution of different patterns of fingerprints

Pattern	N(%)
Loop	1290(53.75%)
Whorl	709(29.54%)
Composite	221(9.20%)
Arch	180(7.5%)
Total	2400(100%)

Table 2: Types of loop pattern

Types of loop Pattern	N(%)
Ulnar	1190(92.24%)
Radial	100(7.75%)
Total	1290(100%)

Table 3: Types of whorl pattern

Types of whorl Pattern	N(%)
Spiral	370(52.18%)
Circular	205(28.91%)
Double core	80(11.28%)
Elliptical	54(7.61%)
Total	709(100%)

Table 4: Types of composite pattern

Types of composite Pattern	N(%)
Twinned loop	94(42.53%)
Lateral pocket loop	59(26.69%)
Accidental	43(19.45%)
Central pocket loop	25(11.31%)
Total	221(100%)

Table 5: Types of arch pattern

Types of arch Pattern	N(%)
Plain	140(77.77%)
Tented	40(22.22%)
Total	180(100%)

Discussion

The word Dactylography is taken from two Greek words, daktylos meaning finger and graphein meaning to write[8]. These epidermal ridge develops due to friction[9]. The fingerprint is an impression of these friction skin ridges which is taken upon unglazed paper with the help of printer's ink[10].

Worldwide percentage distribution of loops, whorls, arches and composite is approximately 60-70%, 25-35%, 7% and 1- 2% respectively[11].

A Study conducted by Prateek R et al., shows less number of whorls (32.55%) amongst medical students[12].

Study conducted by Desai B et al., (29.6%) shows similar distribution of whorl pattern just like worldwide distribution (25-35%)[13].

In Nellimarla, no arches were reported in medical students[14].

Gangadhar M.R, Rajashekara Reddy. K reported in a study that the basic pattern type loops (57.11%) were common followed by whorls

(27.89%) and arches (15.00%) in the general population with significant sex difference[15].

Arabindbasu (1976) reported distributional trend of the three principal pattern types having high frequency of loops, moderate whorls and low arches[16].

Ag VK et al conducted a study in which the Ulnar loop was the most frequently observed pattern followed by Plain whorl, in the total subject population in all ten digits. The least frequently observed pattern in the total population were Simple arches, twinned loops, tented arches, radial loops, accidental types and Exceptional arches both in Male and Female[17].

Nithin V (2009) reported in his study on 250 males and 250 females of south Indian population most frequent fingerprint pattern as ulnar loop in the total population as well as in the sex wise distribution[18].

Conclusion

The present study concluded that loop pattern fingerprints were predominant in medical students. In the loop pattern Ulnar subtype was predominant, in whorl type spiral subtype was predominant, in the composite pattern Twinned loop was predominant and in the arch pattern plain subtype was predominant.

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