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Original Research Article

Study of fingerprint pattern among medical students

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ABSTRACT

Background: Dermatoglyphics/dactylography/dactyloscopy is the scientific study of epidermal ridge pattern on fingers, palm, and soles. The fingerprint is an impression of these friction skin ridges. It is used for personal identification, diseases condition, intelligence of individual and to solve disputed paternity.
Aim: To identify the distribution patterns of fingerprints amongst medical students.
Design: A cross-sectional study was done amongst 200 students out of which 100 were males and 100 were females.
Materials and Methods: Finger prints were taken by using Ink Method by "Cummins and Midlo". The four type and their subtypes were noted.
Results: The most common pattern obtained was loop and least one was arch. The ulnar loops were more than radial loops in loops subtypes. Among whorl patterns, spiral whorl followed by circular whorl was noted. In composite patterns, twinned loops and lateral pocket loops were higher in percentage than accidental and central pocket loops. In arch patterns, plain arch was higher than tented arch.
Conclusion: In our study, Slighty different pattern was obtained as compared to worldwide.

1. Introduction

Dermatoglyphics/dactylography/dactyloscopy is the scientific study of epidermal ridge pattern on fingers, palm, and soles. The word Dactylography is taken from two Greek words, daktylos meaning finger and graphein meaning to write.[1] These epidermal ridge develops due to friction.[2] The fingerprint is an impression of these friction skin ridges which is taken upon unglazed paper with the help of printer's ink.[3] Identification means determination of individuality of a person. It may be complete (absolute) or incomplete (partial). It is used for personal identification, diseases condition, intelligence of individual and in solving disputed paternity.[4] Harold Cummins first coined the term Dermatoglyphics in 1926.[5] As far back as seventieth century AD, the finger print impressions in ink were used in Assyria and Far East as an evidence of good faith in the sealing of bonds or the issue of documents.[6] Sir Edward Richard Henry, Inspector General of Police, Lower Bengal classified the prints for practical application in the field of identification in the 1890's.[7] So, this fingerprinting system is known as Henry-Galton system or simply, Galton's system of identification.[8] They are present at birth, both on epidermis and dermis.[9] They appear as early as 10wk of intrauterine life and fully developed by 24th week. They appear first on fingers then on palm or sole.[10] Once formed, it remains unchanged. So, this is used for identification of individual[11] They are unique to individual. Even two hands are entirely different for identical twins also. Herschel first demonstrated this, and his own impressions taken when aged 28 and again at 82 were unchanged except for the addition of coarse lines due to old age.[12] 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]

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2. Aim

To identify the distribution patterns of fingerprints in males and females.

3. Materials and Methods

A cross-sectional study was done among 200 students.100 were males and 100 were females. The subjects were first year MBBS students of 2018 batch of our Institute. All the subjects were healthy and their age ranged from 17 to 22 years. The written informed consent was taken from the subjects for the study. Ethical approval was obtained from the Institutional Ethical Committee. The objectives of the study were explained to all the participants. They were asked to relax and co-operate to achieve the required movement of the fingers. Finger prints were taken by using Ink Method by “Cummins and Midlo". The materials used were printers, duplicating ink from Kores, ink slab, roller, gauze pads and sheets of paper. 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 were 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. These parameters were compared with the previous study values to confirm if there is any correlation between present and previous study. 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.

3.1. Exclusion criteria

The subjects with any evidence of injury of fingertips that can lead to change in the fingerprint pattern.

4. Results

The rolled fingerprints of all ten fingers of 200 subjects were collected. Hence a total of 2000 fingerprints were obtained, which were analysed and their patterns and subtypes were determined. Distribution of different patterns of finger prints are shown in Table 1. Distribution of different fingerprint patterns was analysed separately for both males and females as shown in Table 2. Types of loop pattern with predominance in males and females are shown in Table 3. Types of whorl pattern with predominance in males and females are shown in Table 4. Types of composite pattern with predominance in males and females are shown in Table 5. Types of arch pattern with predominance in males and females are shown in Table 6. Frequency pattern of fingerprints are shown in Table 7.

Table 1: Distribution of different patterns of finger prints

Pattern	Cases	Percentage
Loop	1140	57%
Whorl	605	30.2%
Composite	139	6.9%
Arch	116	5.8%
Total	2000	100%

5. Discussion

This study was conducted to study various patterns of fingerprints and their distribution among medical students. Most common pattern was loop and the least common was arch. In gender distribution, loops were common among females than males. The whorls were more common in male than female. The distribution of loops, whorls, arches and composite is approximately 65%, 25%, 7%, and 2-3% worldwide respectively.[13] In our study, slightly different pattern was obtained. The loops were most common, arches were least common. But in a study done by British individuals, the frequency of whorls were higher than loops.[14] The frequency of arches were similar to British study but was lower than that of worldwide. The preponderance of loops among medical students in our study is in accordance with the other studies which involved medical students.[10,11] In a study done in Ajmer population, the frequency of loops and whorls were lower than that of arches.[10] In Nellimarla, no arches were reported in medical students.[11] Loops were the predominant pattern in both genders, followed by whorls. Among Zimbabweans, the frequency of loops was significantly higher when compared to other studies. Igbigbi P.S., Msamati BC reported that Ulnar loops were the most predominant digital pattern type in both the sexes, followed by whorls in males and arches in females.[15] The findings were similar to our study. 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.[16] Similar findings were noticed in the present study except arches were lower in number. In contrast to this it was found that the frequency of whorls were more in males. Nithin V reported in his study that the most frequent fingerprint pattern was ulnar loop in the total population as well as in the sex wise distribution.[17] These findings are in agreement with the present study. Arabind Basu observed high frequency of loops, moderate whorls and low arches.[18] Our study revealed same findings. On gender-wise analysis

Table 2: Fingerprint patterns and gender distribution

Pattern	Male		Female	
	No.	%	No.	%
Loop	555	55.5%	585	58.5%
Whorl	330	33.%	275	27.5%
Composite	81	8%	58	5.8%
Arch	34	3.4%	82	8.2%
Total	1000	100%	1000	100%

Table 3: Types of loop pattern

Types of loop	Male	Female	Total
Ulnar	530- 96.36%	554 – 94.7%	1084 -95%
Radial	25-4.5%	31 – 5.2%	56 – 4.9%
Total	555- 100%	585	1140

Table 4: Types of whorl pattern

Types	Male	%	Female	%	Total
Spiral	179	54.4%	184	66.6%	363
Circular	98	29.69%	71	25.8%	169
Double core	35	10%	10	3.7%	45
Elliptical	18	5.4%	10	3.7%	28
Total	330	100%	275	100%	605

Table 5: Types of composite pattern

Type	Male	%	Female	%	Total
Twinned loop	50	61.7%	21	36.20%	71
Lateral pocket loop	23	28.39%	20	34.48%	43
Accidental	08	9.8%	12	20.68%	20
Central pocket loop	00	00%	05	6.25%	05
Total	81	100%	58	100%	139

Table 6: Types of arch pattern

Type	Male	%	Female	%	Total
Plain	28	82.35%	80	97.56%	108
Tented	06	17.64%	02	2.43%	08
Total	34	100%	82	100%	116

Table 7: Frequency pattern of finger prints

Subtype	Male	Female	Total
Ulnar loop	530	554	1084
Spiral whorl	179	184	363
Circular whorl	98	71	169
Twinned loop	50	21	71
Double core	35	10	45
Plain arch	28	80	108
Radial loop	25	31	56
Lateral pocket loop	23	20	43
Elliptical whorl	18	10	28
Accidental	08	12	20
Tented	06	02	08
Central pocket	00	05	05

of all types of fingerprints ulnar loop is the commonest.

6. Conclusion

In this study, distribution of types of fingerprints as well as their subtypes were made out. We found that the distribution of fingerprint patterns in male subjects is similar to that observed in the general sample population, whereas the distribution in female subjects is similar to the general distribution pattern quoted by the previous authors. Little data is available in the literature regarding frequency distribution of subtypes of various fingerprint patterns. Further studies are needed to evaluate the same.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Karmakar RN. Mukherjee"s Forensic Medicine and Toxicology. 3rd ed.; 2007.
2. Mathiharan K, Patnaik AK. Modi"s Medical Jurisprudence and Toxicology. 23rd ed. LexisNexis; 2005.
3. Vij K. Textbook of Forensic Medicine and Toxicology- Principles and Practice. vol. 2011. 5th ed. Reed Elsevier India (P) Ltd;.
4. Sontakke YA. Principle of clinical Genetics. vol. 2018. 1st ed. Jaypee; 2018.
5. Cummins H, Midlo C. Palmar and plantar epidermal ridge configurations (dermatoglyphics) in European-Americans. *Am J Phys Anthropol*. 1926;9(4):471–502.
6. Karmakar RN. J B Mukherjee"s Forensic Medicine and Toxicology. 3rd ed.; 2007.
7. Basu R. Fundamentals of Forensic Medicine and Toxicology. 1st ed. Books and Allied (P) Ltd; 2003.
8. Nandy A. Principles of Forensic Medicine. vol. 2010. New Central Book Agency (P) Ltd;.
9. Parikh CK. Parikh"s Textbook of Medical Jurisprudence and Toxicology. 5th ed.; 1986.
10. Dikshit PC. Textbook of Forensic Medicine and Toxicology. 1st ed. Peepee Publishers and Distributors (P) Ltd; 2007.
11. Reddy KSN. The Essentials of Forensic Medicine and Toxicology. 31st ed.; 2012.
12. Polson CJ. The Essentials of Forensic Medicine. 2nd ed. Pergamon Press Ltd; 1965.
13. Nandy A. Identification of an individual In: Principles of Forensic Medicine. 2nd ed. Calcutta: New Central Book Agency (P) Ltd; 2001.
14. An overview of palmar dermatoglyphics, and fingerprint statistics;. Available from: www.dse.nl/-frvc/handresearch/derm.htm.
15. Igbigbi PS, Msamati BC. Palmar and digital dermatoglyphics of Indigenous black Zimbabweans. *Med Sci Monit*. 2002;8:757–61.
16. Gangadhar MR, Reddy R. Finger dermatoglyphics of Adikarnatakas: A Scheduled caste population of Mysore city, Karnataka. *Man in India*. 1983;83(1&2):183–93.
17. Nithin V. Study of fingerprint classification and their gender distribution among South Indian population. *J Forensic legal Med*. 2009;16(8):460–3.
18. Basu A. Digital dermatoglyphics of three caste groups of Mysore. *Am J Phy Anthrop*. 1976;45(3):437–41.

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