

Original Research

Dactylography-Clinical profiling of medical students

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Abstract

Dactylography refers to the scientific study of fingerprints as a method of identification. Dactylography is based on the principle that skin of the balls of the fingers and thumbs is covered with characteristic ridges, the arrangement and distribution of which remains constant and persists throughout life and that the patterns of no two hands resemble each other, even the fingerprints of identical twins are different. The present study was designed to study the prevalence of different fingerprint patterns among the study population and its variation among different fingers and different individuals as well.

Methods: A total of 100 males and females (each) from MBBS students were enrolled and study was carried out in the department of Forensic Medicine and Toxicology, Government Medical College, Amritsar.

Results: Mean age of the study group was 20.91 ± 1.10 years. Out of 2000 fingers of both hands of all the subjects, both males and females (n=200), the most predominant fingerprint pattern observed was loop pattern seen in 1217 (60.85%) cases, followed by whorls in 705 (35.25%) cases. Arches were observed in 67 (3.35%) cases. The least observed fingerprint pattern was composite pattern in only 11 (0.55%) cases.

Conclusion: The fingerprints are unique to each individual and an important means of personal identification, being easy to compare, transport and store in computers and databases and use cost effective technology. Thus, these must be collected, analysed and stored, which can help in criminal investigations as fingerprints act as an important trace evidence at the scene of crime.

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Introduction:

Dactylography is the scientific study of fingerprints for identification. It is based on the principle that skin of the balls of the fingers and thumbs is covered with characteristic ridges, the arrangement and distribution of which remains constant and persists throughout life and that the pattern of no two hands resembles each other. Identification refers to determination of individuality of a person. It is of two types: Complete and Incomplete, where complete means the absolute fixation of individuality based on unique features present. Partial or incomplete identification implies ascertainment of only one or few facts of a person. Dactylography is one of the most reliable methods and it has been established that no two individuals have similar fingerprints, even the fingerprints of identical twins are

different.² Identification of a person with the help of dactylography has been used since long time and its contribution to law enforcement has been greatest. As fingerprinting is unique, it has provided important service in the area of administration of justice. It has also been very helpful where identification of a person is of utmost importance.³ There are nearly fifty methods in use for the classification of fingerprints throughout the different countries of the world. The method in almost universal use is known as the "Henry System" or the "Galton-Henry Method" or the its name being derived from its originators, Sir Francis Galton and Sir Edward Richard Henry.⁴ There are four main patterns: Loop, Whorls, Arch and Composite.

The present study was designed to study the prevalence of different patterns among the study

population and its variation among different fingers and different individuals as well. It was determined regarding the predominant finger print pattern among the individual digits of the fingers of both hands as well as in the overall individual. Presence of any sexual dimorphism was also considered.

Objectives:

1. Classify the patterns of fingerprints among medical students.
2. Identify the commonest pattern among the medical students.
3. Evaluate any differences in finger prints between both the sexes.
4. Evaluate if any peculiar pattern exists in relation to the sex of an individual.
5. Investigate the potential role of finger prints in personal identification.

Methodology: The present study was conducted at the department of Forensic Medicine and Toxicology, Government Medical College, Amritsar. Approval from the Institutional Ethical Committee, Government Medical College, Amritsar was taken prior to the study. A total of 100 male and 100 female MBBS students were enrolled. Every subject filled a pre-designed questionnaire and informed consent of each subject was obtained before commencing the study.

Inclusion Criteria: Subjects who were healthy and were having normal hands with no congenital or acquired abnormalities were included in the study.

Exclusion Criteria: Subjects who had any evidence of injury of fingertips that lead to change in the fingerprint pattern (Leprosy, Scars of the fingertips, Electrical Burns, exposure to radiation, Dermatitis, Eczema and Lacerations were excluded from the study.

The subjects were asked to wash and dry their hands to remove dirt and grease. For collection of fingerprints, an unglazed white paper was used and uniformly smeared with a thin layer of black printers ink by using the ink pad. The subject was asked to keep his/her arm relaxed and not to try hard to help in rolling the fingers as this may cause smearing. Then the finger bulbs were rolled on the unglazed white paper-the thumbs were rolled towards the subject's body and the fingers were rolled away from the body, i.e. thumb in fingers out method. And then the rolled impressions of each finger were obtained in the allotted space for that finger on the proforma. In this way for each and every individual the entire prints of ten fingers were prepared. Both rolled and plain prints of fingers of right and left hands were taken. Care was taken to avoid sliding of fingers to prevent smudging of print. The patterns of fingerprints were studied with the help of magnifying lens and classified into loops, whorls, arches and composites. The data was collected and analysed with the use of magnifying glass, noted

down the various patterns among the individuals digits, tabulated together and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) and the observations were calculated.

Results:

In our study, a total of 200 undergraduate MBBS students (100 Males and 100 Females) in the age group of 19-24 years were included from Government Medical College, Amritsar. Mean age of the study group was 20.91 ± 1.10 years. Mean age of the males was 20.87 ± 1.10 years, while mean age of the females was 20.96 ± 1.32 years. In this study, it was observed that out of total 200 cases, majority of students 130 (65%) were Hindus, followed by 67 (33.5%) Sikhs. Muslims comprised of (2) 1% cases, and the least number of cases were Christians, 1 (0.5%). Among the total of 200 cases, 148 (74%) cases resided in the urban areas, whereas 52 (26%) cases hailed from rural areas. Out of 200 cases, 187 (93.5%) were the residents of Punjab, while 13 (6.5 %) belonged to other states. Other states include Haryana, Himachal Pradesh, Uttarakhand, Bihar and Chandigarh. Among the total of 1000 fingers of both hands in males, the most frequent fingerprint pattern observed was loop pattern, which was seen in total 603 (60.3%) cases, out of which 302 (60.4%) loop patterns were present in right hands and 301 (60.2%) cases of loops were observed in left hands of males, followed by whorl pattern, which was observed in total 351 (35.1%) cases, out of which 176 (35.2%) cases were observed in right hand and 175 (35%) cases in the left hand. Arch pattern was observed in total 42 (4.2%) cases among males, out of which, 20 (4%) cases were observed in the fingers of right hand and 22 (4.4%) cases in the fingers of left hand. The least observed fingerprint pattern was composite pattern. Among all the males, composite pattern was observed in total 4 (0.4%) cases, out of which 2 (0.4%) cases were seen in both right hand and left hand each. The fingerprint patterns of both the hands among males was almost similar with no significant difference. Among the total of 1000 fingers of both hands in females, the most frequent fingerprint pattern observed was loop, which was seen in total 614 (61.4%) cases, out of which the most common fingerprint pattern noted was loop in right hand with 310 (62%) cases and 304 (60.8%) cases of Loops were seen in left hands of females, followed by Whorl pattern, which was observed in total 354 (35.4%) cases, out of which 174 (34.8%) cases were observed in right hand and 180 (36%) cases are observed in the left hand. Arch pattern was seen in total 25 (2.5%) cases among females, out of which, 12 (2.4%) cases were observed in right hand and 13 (2.6%) cases were seen in the fingers of left hand. The least observed fingerprint pattern was composite. Among all the females, composite pattern was observed in total 7 (0.7%) cases, out of which 4 (0.8%) cases were seen in right hand and 3 (0.6 %) cases were observed in the left hand. Again no

significant difference was observed in both hands among females

Table 1:Overall Fingerprint Patterns Of All The Fingers Of Both The Hands Among Males & Females.

PATTERN	MALE				FEMALE				TOAL		
	Right	Left	Total		Right	Left	Total		No.	%age	
			No.	%			No.	%			
LOOP	302	301	603	60.3	310	304	614	61.4	1217	60.85	
WHORL	176	175	351	35.1	174	180	354	35.4	705	35.25	
ARCH	20	22	42	4.2	12	13	25	2.5	67	3.35	
COMPOSITE	02	02	04	0.4	04	03	07	0.7	11	0.55	
TOTAL	500	500	1000	100	500	500	1000	100	2000	100	
(X ² : 0.1; df:3; p= 0.99, p < 0.05 significant)				(X ² : 0.343; df:3; p=0.951 ,p< 0.05 significant)							

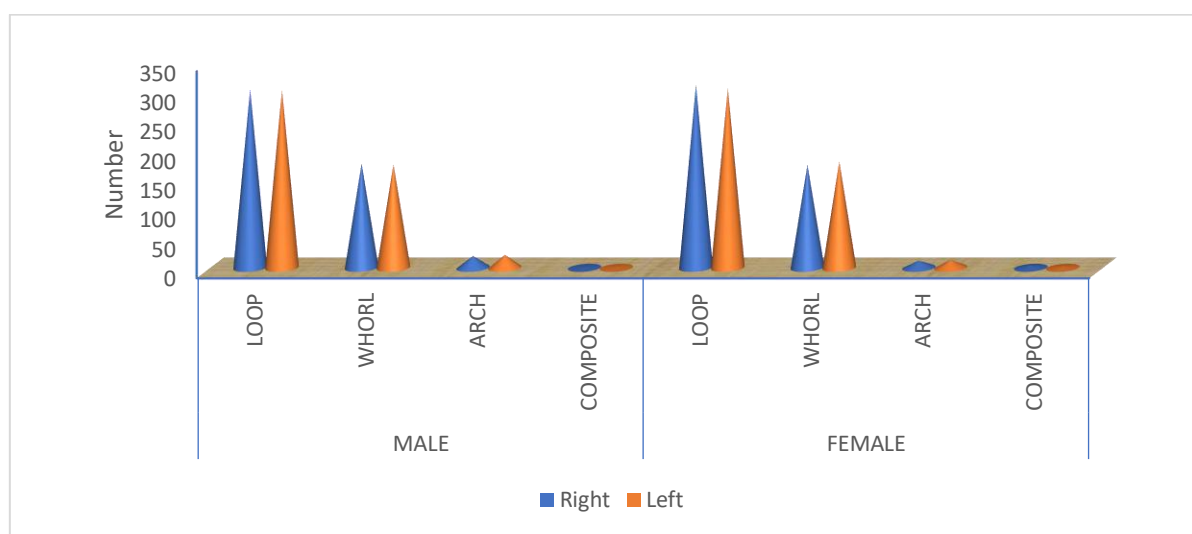


Table 1:Among total of 2000 fingers of males and females each (n = 200), the most predominant fingerprint pattern observed among total subjects was loop pattern, which was observed in 1217 (60.85%) cases. In both males and females, the most common pattern noted was loop, which was observed in 603 (60.3%) cases among males and 614 (61.4%) cases among females followed by whorl pattern, which was observed in total 705 (35.25%) cases, out of which 351 (35.1%) cases were observed in males and 354 (35.4%) cases in females, respectively. Arch pattern was observed among total 67 (3.35%) cases, out of which 42 (4.2%) cases were observed in males and 25 (2.5%) cases infemales. The least observed pattern was composite pattern among both the genders with total 11 (0.55%) cases, out of which 4 (0.4%) cases were seen among males and 7 (0.7 %) cases among females.It was observed in the present study that among the both sexes, the fingerprint pattern of males and females show no substantial gender differences as all the four patterns viz loops, whorls, arches and composite were present in almost same number among the both sexes.

Discussion:

In the present study, mean age of the study group was 20.91±1.10 years , whichwas similar to other studies conducted by Rastogi P et al (2010)⁵, Karki RK et al (2014)⁶ , Deopa D et al (2014)⁷, Mehta AA et al (2015)⁸, Shreshtha DB et al (2016)⁹, Singh S et al (2018)¹⁰ and Vankara et al (2021)¹¹where the age group studied was from 17 to 27 years. The other studies conducted by Khadri et al (2013)¹², Patil et al (2017)¹³ and Shreshtha I et al (2019)¹⁴, were conducted on different age group from the present study, where the age group of the population was 18 to 65 years. In the present study, a total of 200 undergraduate MBBS students were included, comprising of 100 (50%) males and 100 (50%) females each. The findings of the present study were similar with the studies conducted by Nithin et al (2009)¹⁵, Rastogi P et al (2010)⁵, Khadri et al (2013)¹², Karki RK et al (2014)⁶, Ekanem AU et al (2014)¹⁶, Mehta AA et al (2015)⁸, Shukla S et al (2016)¹⁷, Narayana BL et al (2016)¹⁸ and Marigoudar RM et al (2019)¹⁹, where equal number of male and female subjects, 50% each, were included in the

studies. In other studies conducted by Bansal et al (2014)²⁰, Sangam MR et al (2011)²¹, Deopa D et al (2014)⁷, Shreshtha R et al (2014)⁹, Salmani D et al (2016)²², Patil A et al (2017)¹³, Singh S et al (2018)¹⁰, where the male and female subjects were not equal in number, which is not consistent with the present study.

The studies conducted by Nithin et al (2009)¹⁵, Rastogi P et al (2010)⁵, Sangam MR et al (2011)²¹, Salmani D et al (2016)²², Narayana BL et al (2016)¹⁸, Marigoudar RM et al (2019)¹⁹, Vankara et al (2021)¹¹ were conducted on South Indian population while studies conducted by Singh S et al (2018)¹⁰, Ranjan RK et al (2015)²³, Shukla S et al (2016)¹⁷, Deopa D et al (2014)⁵ were conducted on North Indian population. While Mehta AA et al (2015)⁸ and Patil A et al (2017)¹³ conducted similar studies on the Maharashtrian population of western India.

In another study conducted by Butt MK et al (2017)²⁴, which included students from Lahore, Pakistan while Karki RK et al (2014)⁶ and Shreshtha R et al (2014)⁹ conducted their studies on the population of Nepal region. In another studies conducted by Eboh D et al (2013)²⁵ and Ekanem AU et al (2014)¹⁶ were conducted on population of Nigeria. No study was available for comparison as far as region or area of living is concerned.

Patterns of fingerprints among the males :

Among the total of 1000 fingers of both hands in males, the most frequent fingerprint pattern observed was loop, which was seen in total 603 (60.3%) cases. The least observed fingerprint pattern was composite. Most of the studies previously conducted had shown the similar trend of the fingerprint patterns, as compared to the findings of the present study. Loop pattern was the most common fingerprint pattern among males, followed by whorls, arches and composite pattern. In other studies conducted by Shreshtha et al (2016)¹⁴, it was observed that the most common fingerprint pattern was loop observed in 58.08 % cases, followed by whorl in 28.83% cases, arch in 8.44% cases and composite pattern in 7.66% cases. In another study conducted by Mehta AA et al (2015)⁸, the most predominant fingerprint pattern observed was loop pattern in 53.64% cases, followed by whorls in 38.14 % cases. The least number of cases were of arch pattern observed in 8.21 % cases. The study conducted by Salmani D et al (2016)²², Shukla S et al (2016)¹⁷ and Mohsin TS et al (2019)²⁶, where loop pattern among males was present in majority of cases followed by whorls and arch pattern. In contrast, in the study by Karki RK et al (2014)⁶, it was observed that among males, the most common fingerprint pattern was whorl pattern observed in 57.9% cases, followed by loops in 35.8% cases and arch pattern in 6.3% cases. The probable reason of the difference can be due to the large variation of fingerprints among the study population and also various factors like difference in race, geographical

region, presence of any disease and variation of occupation among the study population.

Patterns of fingerprints among the females :

Among females, the most frequent fingerprint pattern observed was also loop pattern, which was seen in total 614 (61.4%) cases. The findings of the present study were similar to the studies conducted by Shukla S et al (2016)¹⁷, Mohsin TS et al (2019)²⁶, and Salmani D et al (2016)²², the most predominant fingerprint pattern observed was loop pattern in majority of cases followed by whorls and arch pattern. A study by Shreshtha DB et al (2016)⁹, it was found that the loop pattern was the most predominant pattern with 48.47% cases, followed by whorls with 32.71% cases, arch pattern was observed in 15.93% cases and composite pattern in 2.88% cases. Another study conducted by Shreshtha et al (2014)¹⁴, also observed the similar patterns where loop pattern was the most predominant pattern observed in 52.7% cases, followed by whorls with 41.3% cases, arch pattern in 5.05% cases and composite pattern in 0.85% cases. Another study by Karki RK et al (2014)⁶ also observed that the loop pattern as the most common pattern among females in 68.6 % cases, followed by whorl pattern in 29.5% cases and arch pattern in 8.35% cases.

Patterns of fingerprints among all the students :

Among total of 2000 fingers of males and females each (n=200), the most predominant fingerprint pattern observed among total subjects was loop pattern, which was observed in 1217 (60.85%) cases. The p value in male participants was 0.991 and in females was 0.951 which was statistically non-significant. A study by Bhardwaja et al (2004)²⁷, in which loop pattern was the most predominant fingerprint pattern observed in 51.87 % cases while the whorls and arches were seen in 35.83% cases and 12.30% cases respectively. Bansal et al (2014)²⁰, found loop pattern in 54.15% cases, followed by whorl pattern in 26.53% cases and arches in 2.92% cases, while composite pattern was observed in 14.26% cases. Another study conducted by Ekanem AU et al (2014)¹⁶ also observed the same patterns. Ranjan et al (2015)²³ conducted a study, similar to the present study, and noticed loops in majority of cases (52.2%), followed by whorls in 37.45 cases and arches in 10.4% cases. Singh S et al (2018)¹⁰, Patil A et al (2017)¹³, Butt MK et al (2017)²⁴, Salmani D et al (2016)²², Shreshtha DB et al (2016)⁹, Narayana BL et al (2016)¹⁸, Shukla S et al (2016)¹⁷, Mehta et al (2015)⁸ and Deopa D et al (2014)⁵ had similar findings. The other studies conducted by various authors also observed similar findings as that of present study which concluded the loops to be the most predominant fingerprint pattern followed by whorls and arches as observed by Igbigbiet al (2002)²⁸, Nithin et al (2009)²³, Khadri et al (2013)¹², Shreshtha R et al (2014)¹⁴, Marigoudar et al (2019)¹⁹ and Vankara et al (2021).¹¹

It was observed in the present study that among the both sexes, the fingerprint pattern of males and females showed no substantial gender differences as all the four patterns viz Loops, Whorls, Arches and Composite pattern were present in almost same number among the both sexes. Though, the findings were inconsistent with the available literature that most common pattern among the both sexes was loop pattern followed by whorls and arches. The composite pattern being the least common among the population. However, the findings in the present study are not consistent with the observations made by Karki RK et al (2014)²⁸ where in males the most predominant pattern was whorl pattern (57.9%) while in females it was loop (68.6%).

Conclusion:

The results of the present study are consistent with the available literature of Forensic Anthropology. The fingerprints are unique to each individual and are an important means of personal identification. Thus, these must be collected, analysed and stored, which can help in criminal investigations as fingerprints act as an important trace evidence at the scene of crime. It is thus suggested that more studies of fingerprints, which include other factors like occupation and the disease should be taken into consideration on substantial number of population.

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