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ORIGINAL ARTICLE

Study of fingerprint pattern among medical students in a tertiary hospital in Nepal: a descriptive cross-sectional study

Salmalee Yadav[1]

Dept. of Forensic Medicine, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Nepal

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Correspondence:
Dr. Salmalee Yadav
Dept. of Forensic Medicine, Patan Hospital, Patan, Academy of Health Sciences, Lalitpur, Nepal
Email: salmaleeyadav@pahs.edu.np

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Abstract

Introduction: The fingerprints are most reliable form of identification because they do not change from birth to death. Fingerprints have different variations in their patterns and have great importance in scientific, morphological, criminological, biological and anthropological studies. We studied the fingerprint patterns among the medical students and difference of fingerprint pattern in male and female students.

Method: A descriptive cross-sectional study was conducted among 250 medical students of Maharajgunj Medical College. The study was carried from 1st August 2019 to 1st August 2020 after receiving ethical approval from the ethical committee. The fingerprint patterns of both hands were collected and identified with magnifying glass and loops, whorls, arches and composite are documented and analyzed in SPSS 16 version.

Result: The most predominant pattern was loop 1092(43.68%) followed by whorls 1035(41.40%), arches 225(9%) and composite 148(5.92%). The males had higher incidence of loops 599(47.9%) compared to females 493(39.40%).

Conclusion: Loop fingerprint was predominant pattern in most of the fingers. The loops fingerprint pattern was found to be more prevalent in males than that of females.

Keywords: Dermatoglyphics, Gender, Pattern

INTRODUCTION

Identification is one of the main objectives of forensic medicine, and the fingerprint system is one of the best tools for identification purposes. Fingerprints remain the easiest and most reliable method for positive identification.[1] Fingerprints have great importance in scientific, morphological, criminological, biological and anthropological studies.[2] They can be used not only to identify criminals but also to discriminate amnesic people, and unrecognized dead bodies, mummified bodies, mutilated bodies. It has been estimated that the chances of two individuals having identical finger impressions are practically nil. Even the fingerprints of identical twins are not similar.[3] Sir Edward Henry modified Galton's arch, loop, and whorl system into four main groups according to the percentage of the distribution as loop (65%-67%), whorls (25%), arch (6%-7%) and composite (3%-4%).[4]

Our study aimed to enhance the understanding of fingerprint pattern distribution among the medical students of Maharajgunj Medical College and the difference in fingerprint patterns among male and female students, which can significantly aid in the identification process in forensic medicine which is critical for improving identification protocols and ensuring accurate identification in forensic investigations, thereby contributing to the advancement of forensic medicine and the effective administration of justice.

METHOD

This was a descriptive cross-sectional study which was carried out on 250 students with the age of 18 years and above of medical students of Medical Maharajgunj Campus over a year from 1st August 2019 A.D. to 1 August 2020 A.D. Firstly the ethical clearance was taken from the Institutional Review Committee (IRC) of Institute of Medicine (IOM) with Reference number: 238/ (6-11)E^2/076/077. Students with major deformities (congenital/accidental) of upper extremities, permanent scars on fingers and thumbs, leprosy and eczema of fingers and thumbs and non- Nepalese students were excluded from the study. The materials that were used in the study were a black ink pad, A4 size paper and a magnifying glass. Informed consent was taken from the students by explaining the procedure. The students were asked to wash their hands thoroughly. After the hands were dry each participants were asked to press their fingers on the black ink pad and imprint the finger's fingerprint in the blocks provided on A4 size paper. The fingerprint patterns on both hands were identified with the help of a magnifying glass. The data collected were analyzed with the help of SPSS 16 to obtain variations of fingerprint patterns.

RESULT

The fingerprint pattern analysis of 2500 fingers showed that loops 1092(43.68%) were most common fingerprint pattern followed by whorls 1035(41.40%), arches 225(9%) and composite 148(5.92%). The males had higher incidence of loops 599(47.9%) compared to females 493(39.40%). The female had higher incidence of whorls 634(50.7%) compared to males 401(32.1%) and males have more arches 117(9.4%) than females 108(8.6%). The composite pattern was more in males 133(10.6%) compared to females 15(1.2%) as shown in Table 1.

The predominant fingerprint pattern which was loop is found in left little finger, left middle finger and right middle finger followed by whorl pattern in the left ring finger, left index finger, left thumb, right ring finger, right index finger and right thumb. The least noted fingerprint patterns in each finger were arch and composite as shown in Table 2.

Table 1. Distribution of fingerprint patterns among male and female students

Pattern	Male(%)	Female(%)	Total (%)
Loop	599(47.9)	493(39.4)	1092(43.68)
Whorl	401(32.1)	634(50.7)	1035(41.4)
Arch	117(9.4)	108(8.6)	225(9)
Composite	133(10.6)	15(1.2)	148(5.92)

Table 2. Distribution of fingerprint patterns in ten fingers of right and left hands among male and female students

Fingers	Pattern in males, N (%)				Pattern in Females, N (%)			
	Loop	Whorl	Arch	Composite	Loop	Whorl	Arch	Composite
Right thumb	54(43.2%)	50(40%)	6(4.8%)	15(12%)	41(32.8%)	67(53.6%)	15(12%)	2(1.6%)
Right index	56(44.8%)	41(32.8%)	17(13.6%)	11(8.8%)	36(28.8%)	67(53.6%)	21(16.8%)	1(0.8%)
Right middle	61(48.8%)	39(31.2%)	6(4.8%)	19(15.2%)	57(45.6%)	57(45.6%)	11(8.8%)	0
Right ring	58(46.4%)	48(38.4%)	15(12%)	4(3.2%)	47(37.6%)	72(57.6%)	6(4.8%)	0
Right little	69(55.2%)	32(25.6%)	19(15.2%)	5(4%)	57(45.6%)	66(52.8%)	2(1.6%)	0
Left thumb	50(40%)	36(28.8%)	6(4.8%)	33(26.4%)	39(31.2%)	67(53.6%)	9(7.2%)	10(8%)
Left index	49(39.2%)	40(32%)	28(22.4%)	8(6.4%)	35(28%)	57(45.6%)	31(24.8%)	2(1.6%)
Left middle	72(57.6%)	29(23.2%)	14(11.2%)	10(8%)	55(44%)	60(48%)	10(8%)	0
Left ring	46(36.8%)	58(46.4%)	4(3.2%)	17(13.6%)	57(45.6%)	67(53.6%)	1(0.8%)	0
Left little	84(67.2%)	28(22.4%)	2(1.6%)	11(8.8%)	69(55.2%)	54(43.2%)	2(1.6%)	0

DISCUSSION

The study was conducted to study various patterns of fingerprints and distribution among medical students. In our study, the most predominant fingerprint pattern was the loop pattern followed by the whorl pattern. The least noted fingerprint patterns on each finger were the arch and composite. The predominant fingerprint pattern in our study was loop. In present study the most predominant fingerprint pattern were the loop pattern in the left little finger, left middle and right middle fingers and a similar study was done by Kumar KR which also showed loop pattern in little fingers and middle finger.[5] Whorls were common in ring finger, followed by thumb and index finger in our study with similar findings were found in studies done in similar settings.[6,7]

Although loops were the predominant patterns followed by whorls and arches in our study, which was similar to the worldwide average, the frequency of whorls is higher and loops are lower in comparison to the standard distribution of occurrence. A similar study was done in 2002 on black Zimbabweans showed loops were most predominant digital pattern type in both sexes followed by whorls in males and female.[8] In our study, the males had higher loop pattern (n=599) than females (n= 493). A similar study was done by Basu et.al. presented similar results of high frequency of loops, moderate frequency of whorls and a low frequency of arches.[9]

The results of a similar study by Deepa Deopa, et al. on medical students of Government Medical College showed loops (58.29%) fingerprint pattern were most common followed by whorls(37%) and arches(4.71%) were the least common.[10] Similar study done by Nithin et.al. in 2009, reported on his study that 250 males and 250 females of south Indian population frequent pattern loop in the total population as well as in the gender wise distribution.[11] Our findings of the whorl pattern are higher in females than males. Similar results were found by Ekanem et al which showed females had the highest number of whorls than males.[12] Qayyaum R et.al conducted a study in 2013 in a group of fifty medical students of third year MBBS of Rawalpindi Medical College reported majority of the respondents were found to have loop type of fingerprint followed by whorl(n= 130), composite(n= 45) and arch(n=42) print.[13] Sangam MR, Krupadanam K, Anasuya K, done a study on South Indian population showed loops and arches were seen higher in males than in females.[14]

Since Nepal is prone to natural disasters like floods, landslides, earthquakes, and avalanches and also susceptible to manmade disasters like accidents, plane crashes and industrial accidents it is absolutely essential to have a proper identification system developed. And the proper functioning of such a system would ensure that all the unidentified citizens of the country, living and deceased could be reliably identified.

There were some limitations in our study. Firstly, the results of this study were based on the records of medical students of single medical school which might have led to limited diversity of data. Some fingerprints were not properly imprinted on unglazed paper, leading to challenges in studying the variations.

CONCLUSION

In finger wise distribution of fingerprints, the loop fingerprints were predominant in most of the fingers. The general distribution of fingerprint pattern in our study showed that loops fingerprint patterns were found to be more prevalent in males than that of females. Fingerprints have already been established entity in the field of identification. Similar studies should be done in larger group so as to increase the accuracy of prediction and to establish the individuality of a person.

DECLARATIONS

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Conflict of Interest

None

Funding

None

Ethical Clearance

It was taken from IRC of Institute of Medicine with Reference number: 238/(6-11)E^2/076/077.

Consent for Study

Informed consent was taken from study participants.

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