



Study of Fingerprint Patterns among Medical Students in IGIMS, Patna, Bihar

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Abstract

Objectives: To know the distribution of fingerprint patterns on different digits in males and females.

Methods: In this cross-sectional study, 4000 rolled fingerprints taken from 400 medical students among which 200 were males and 200 were females, were studied. All healthy individuals with no history of any genetic disorders and skin disorders were included in the study. The present study evaluates the distribution of dermatoglyphic fingertip patterns in both hands among males and females and the findings of the study are compared with the available data.

Results: Out of the 4000 fingerprint patterns studied, Loops (57.2%) were the most common pattern followed by whorls (38.3%) and arches (4.5%) being the least common pattern. Loops were the most common patterns on the index, middle and little fingers, predominance of whorls was seen on thumb and ring fingers. Arches were seen most commonly (10%) in Index finger. Arches were higher on index fingers of males (17%) when compared to females (10%). In males, whorls, loops and arches were 39.6 %, 55.2% and 5.2% respectively while in females whorls were 38.2 %, loops 57% and arches were 4.8 %.

Conclusions: Frequency of distribution of dermatoglyphic patterns among Undergraduate Medical students differs from other population groups. Frequency of loops is comparatively lower while that of whorls higher. Bilateral variations and gender based differences could not be established. Similar studies in other population groups are recommended for better correlation.

Keywords: Fingerprint, Loops, Whorls, Arches, Ectoderm, Dermatoglyphic.

Introduction

The study of epidermal ridges and their configuration on the palmar aspect of hand and plantar surface of foot is called as Dermatoglyphics^[1]. The terminology Dermatoglyphics was derived from the Greek words (derma, skin and glyphics means curved)

and was first coined by Harold Cummins in 1926^[2]. These epidermal ridges correspond to underlying pattern of dermal papillae. The dermatoglyphic pattern makes their appearance as early as 10th week of intrauterine life^[3]. Ridges development is seen to be affected by genetic and environmental factors. The characteristics of

original ridge patterns are not disturbed unless the skin is damaged to a depth of about 1 mm^[4]. Pattern of fingerprint remains unchanged throughout life and is one of the most reliable criteria of identification. Galton classified different fingerprint patterns on the basis of their primary pattern as loops, whorls and arches^[5]. Galton type dermatoglyphic patterns is said to vary in different ethnic groups, and its association with diseases of genetic origin has been reported in the past^[6,7]. Although average distribution of different dermatoglyphic patterns is known worldwide^[8], published literature on the distribution of dermatoglyphic patterns on individual digits are very few. So the present study has been done to know the distribution of fingerprint patterns on different digits in males and females.

Material and Methods

The cross-sectional study was carried at Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar in 2017. The material consisted of 4000 rolled fingerprints taken from 400 medical students among which 200 were males and 200 were females. Informed written consent was taken from the study subjects before taking the fingerprints. The age group of the medical students ranged from 19 to 24 years. All healthy individuals with no history of any genetic disorders and skin disorders were included in the study. 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. Thus the finger tip patterns were recorded and studied with the help of magnifying lens. Finger print patterns were identified as: Loops, Whorls and Arches based on

appearance of ridge lines. The sheets were coded with name, age, sex, address. The present study evaluates the distribution of dermatoglyphic fingertip patterns in both hands among males and females and the findings of the study are compared with the available data.

Results

Table 1 shows the distribution of fingerprint patterns in right and left hands of 400 medical students. A total of 4000 fingerprint patterns were studied. Loops (57.2%) were the most common pattern followed by whorls (38.3%) and arches (4.5%) being the least common pattern. While loops were the most common patterns on the index, middle and little fingers, predominance of whorls was seen on thumb and ring fingers. Loops were most abundantly seen on little finger (75.5%) followed by middle finger (74.5%) while it was least observed in index finger (51 %). Frequency of whorls was predominant on the ring finger (55.5%) followed by thumb (54.5%). Although the frequency of Arches pattern were least, it was seen most commonly (10%) in Index finger while it was least observed (1%) in ring finger. Table 2 shows the sexual dimorphism of fingerprint patterns. Arches were higher on index fingers of males (17%) when compared to females (10%). In males, whorls, loops and arches were 39.6 %, 55.2% and 5.2% respectively while in females whorls were 38.2 %, loops 57% and arches were 4.8 %. There was insignificant difference in overall distribution of fingerprint pattern in both hands among males and females.

Table 1: Distribution of Fingerprint Patterns in Right and Left Hands

DIGIT		n	WHORLS (%)	LOOPS (%)	ARCHES(%)
THUMB	RIGHT	400	224 (56)	152 (38)	24 (6)
	LEFT	400	212 (53)	180 (45)	8 (2)
	R + L	800	436 (54.5)	332 (41.5)	32 (4)
INDEX	RIGHT	400	144 (36)	208 (52)	48 (12)
	LEFT	400	168 (42)	200 (50)	32 (8)
	R + L	800	312 (39)	408 (51)	80 (10)
MIDDLE	RIGHT	400	80 (20)	308 (77)	12 (3)
	LEFT	400	88 (22)	288 (72)	24 (6)
	R + L	800	168 (21)	596 (74.5)	36 (4.5)
RING	RIGHT	400	228 (57)	168 (42)	4 (1)
	LEFT	400	216 (54)	180 (45)	4 (1)
	R + L	800	444 (55.5)	348 (43.5)	8 (1)
LITTLE	RIGHT	400	88 (22)	300 (75)	12 (3)
	LEFT	400	84 (21)	304 (76)	12 (3)
	R + L	800	172 (21.5)	604 (75.5)	24 (3)
ALL DIGITS	RIGHT	2000	764 (38.2)	1136 (56.8)	100 (5)
	LEFT	2000	768 (38.4)	1152 (57.6)	80 (4)
	R + L	4000	1532 (38.3)	2288 (57.2)	180 (4.5)

Table 2: Distribution of Fingerprint Patterns among Males and Females

DIGIT	SEX	WHORLS (%)	LOOPS (%)	ARCHES (%)
THUMB (n= 400)	Male	220 (55)	176 (44)	4 (1)
	Female	212 (53)	164 (41)	24 (6)
INDEX (n= 400)	Male	144 (36)	188 (47)	68 (17)
	Female	156 (39)	204 (51)	40 (10)
MIDDLE (n= 400)	Male	108 (27)	272 (68)	20 (5)
	Female	88 (22)	300 (75)	12 (3)
RING (n= 400)	Male	228 (57)	168 (42)	4 (1)
	Female	220 (55)	168 (42)	12 (3)
LITTLE (n= 400)	Male	92 (23)	300 (75)	8 (2)
	Female	88 (22)	304 (76)	8 (2)
ALL DIGITS (n= 2000)	Male	792 (39.6)	1104 (55.2)	104 (5.2)
	Female	764 (38.2)	1140 (57)	96 (4.8)

Discussion

The finger ridge pattern is different for every individual and its development is genetically determined which remains ubiquitous throughout life. The epidermal ridge patterns develops between 10th and 24th week of gestation^[9]. The critical growth of the brain also occurs during this period. Since the skin and brain develop from the same ectoderm, dermatoglyphic variations are evidence for early developmental brain disturbances^[10]. The percentage of worldwide distribution of loops, whorls, arches and composite is 65%, 25%, 7% and 2- 3% respectively^[8]. Although loops were the predominant patterns followed by whorls and arches in our study which is closely similar to the worldwide average and with the most of the

studies conducted previously^[11,12]. Frequency of arches in our study was lower to worldwide average but similar to that found in study of Kanchan et al^[13]. Overall preponderance of loops among medical students in our study is in accordance with that reported in other studies involving medical students^[11,12]. Frequency of loops and whorls in our study was higher and that of arches lower when compared to study done at Ajmer^[11]. Our study of dermatoglyphic patterns on individual digits revealed that there was preponderance of loops on the little and middle finger, whorls on the thumb and ring finger and arches on the index finger in both hands of both sexes, which is similar with the study done by Kanchan et al^[13] and Mehta et al^[14]. Loops were more frequently encountered patterns in females

and on the left side while whorls were more common in males and on the left side [Table 1 & 2]. The variation between sides is similar to that seen in study done by Kanchan et al^[13]. The overall distribution of different dermatoglyphic 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^[15].

Conclusion

Frequency of distribution of dermatoglyphic patterns among Undergraduate Medical students differs from other population groups. Frequency of loops is comparatively lower while that of whorls higher. There was a significant increase in frequency of loops in middle and little fingers, thumb and ring fingers showed predominance of whorls and there is definite predominance of arches on the index finger. Distribution of dermatoglyphic patterns was almost similar on both hands and both sexes. Bilateral variations and gender based differences could not be established. Similar studies in other population groups are recommended for better correlation.

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