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FINGERPRINT PATTERN ASSOCIATION WITH GENDER AND BLOOD GROUPS AMONG MEDICAL STUDENTS

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ABSTRACT

Objective: To determine association of fingerprint patterns with gender and blood groups among medical students of Peshawar Medical College.

Material and Methods: This cross-sectional study was conducted on 252 students of Peshawar Medical College Peshawar. A pre-designed questionnaire was used interview-based to collect the data. SPSS v.25 was used as a statistical analysis tool.

Results: In our study males were more than females with 147(58.33%), and 105(41.67%) respectively. The majority of fingerprints patterns were loop (54.68%), followed by whorl (33.66%) and least common were arch (5.55%). The right hand fingers R1, R4 and R5 (thumb, ring and little fingers) and left hand fingers L1 and L2 (thumb and ring fingers) had significant association with blood groups with p value less than 0.05, but gender did not have significant association with fingerprint patterns on both hands except right and left thumb(R1+L1).

Conclusion: The study's outcomes suggest that the loop fingerprint is the most prevalent type among medical students, followed by the whorl fingerprint. In terms of fingerprint relationship statistics, blood types were found to be significant for the first, fourth, and fifth right fingers, as well as the first and second left fingers while gender was found significant for first right and left fingers.

Keywords: Fingerprint, pattern, medical students, blood groups, gender.

Introduction

Dactylography is the study of fingerprints. Skin on the tip of fingers and thumbs has ridges that remain consistent throughout life. Identification is the characteristics of the individuality of the person. Two types of identification are complete and incomplete [1.] In forensic medicine, multiple parameters are used for identification among which the most reliable factors are fingerprints, DNA matching/study, and iris imaging.[2] Fingerprinting is widely used as an effective and inexpensive method of identification. Impressions formed by the fingerprints is known as fingerprint pattern[3]. The skin of the finger consists of a raised portion(ridges) and a depressed portion.[4] Fingerprints are affected by multiple factors including hereditary, environmental, and other regional factors[5]. The furrowed skin

on the palmar and plantar surfaces of the hands and feet has friction ridges. During embryonic life, these ridges were produced and remain constant throughout their life until and unless body decomposed permanently or skeletonized as result of which the ridges were destroyed and no longer useful [6]. Changes at genes level causes chromosomal syndromes which may affect the fingerprint patterns like In Down syndrome and turner syndromes there are prevalence of loop and whorl patterns respectively [7]. Fingerprints have four main categories: loop, whorl, arch, and composite. Fingerprints can be extracted from decomposed bodies in which dermis is intact and epidermis destroyed as well as from mummified bodies by soaking the fingertips in a mild alkaline solution. In this modern era with the help of sophisticated technology, fingerprints can be transferred across continents or between nations [8]. Dermatoglyphics traits have strong association with certain diseases specially genetical diseases like down syndrome, turner and Edward syndromes [9]. The development of the primary ridges begins at 3-4 months and completed at the 6th month of pregnancy[10].

Clinically two blood group systems are important. One is ABO and the other is the Rhesus system. When a specific antigen is present, then the corresponding antibodies are absent this is called Landsteiner 's Law.[11] 'ABO' blood group system is further classified as A, B, AB, and O blood group types according to the presence of corresponding antigens in plasma. The 'Rhesus' blood group system is classified into 'Rh positive' and 'Rh negative' based on the presence or absence of a 'D' antigen. [12] Human beings have been using fingerprints as a means of identification for a long time but the objective of our study is to determine fingerprint association with gender and blood group". So that one can predicts the gender or blood groups from fingerprint patterns

MATERIALS AND METHODS: -

This cross-sectional study was conducted at Peshawar Medical College, Peshawar from 1st December 2021 to 1st June 2022, and a total of 252 medical students were included and data was collected after getting ethicl approval with Reference No: PMC/PGMDE/369. The sample size was calculated by using the following formula.

Using a formula for finite population[24]i.en $= \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1+\frac{z^2 \times p\,(1-p)}{e^2 N}}$ (CI=95%, p=0.5%, e=0.05, N = population size that varies).

Simple random sampling technique was applied. Research randomizer online was applied to select the sample randomly. Those students, who deny giving consent after being selected by randomizer, skipped and next available student was enrolled. Students of any age and gender from all professional years of Peshawar Medical College, Peshawar were included in our study. While Students with any hand deformity like permanent scars on fingers, extra fingers as well as diseases of fingers in which epidermis is destroyed like leprosy.

Every medical student in this study was requested to wash their hands with soap and water and dry them with a towel. To transfer their fingerprints, students were directed to touch their fingertips on the pad and then the paper. The method was done for all fingers on both hands. Thus, all ten digits' simple fingerprints were obtained individually on the same paper. The fingerprint patterns were classified by magnifying lens. Every finger on the fingerprint slip was numbered: The right thumb got 1st and the left little finger got 10th. Antiserum A, B, O, and D identified A, B, O, and Rh blood types. Frequency and percentages were measured for categorical variables. Stratified data was cross-tabulated and the Chi-square was applied to check association for which significant value <0.05.

3Results:

In the sample of 252 students, males were dominant in gender with 58.33%, while females were 41.67%, details are given below.

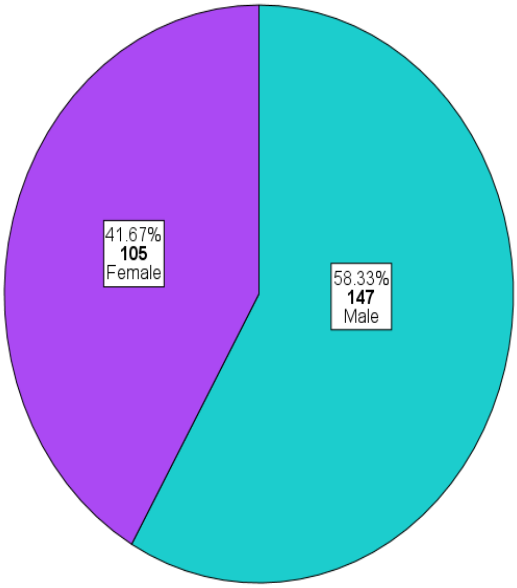

Figure 1: **Pie chart representing gender-wise distribution among students**

Table 1 shows fingerprints patterns among medical students

This table shows that most common fingerprint pattern was loop with a frequency of 1378(54.68%), followed by whorl pattern 33.66% and least common was arch 5.55%.

Pattern of finger Print	**Frequency(%)**
Loop	1378(54.68%)
Whorl	847(33.66%)
Arch	140(5.55%)
Composite	155(6.11%)
Total	2520(100%)

Table 2a shows left hand fingers (L1,L2) has significant association with blood groups.

Table 2a shows Finger print patterns of left hand with Blood Groups

Finger Type	Pattern	Blood Group							Statistics	
		A+ve	B+ve	B-ve	AB+ve	AB-ve	O+ve	O-ve	Chi-Square (df)	P-value
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
L1	Loop	33 (25.2)	47 (35.9)	1 (0.8)	16 (12.2)	3 (2.3)	31 (23.7)	0 (0)		
	whorl	18 (21.7)	28 (33.7)	7 (8.4)	5 (6)	0 (0)	20 (24.1)	5 (6)		
	Arch	2 (14.3)	7 (50)	0 (0)	0 (0)	0 (0)	4 (28.6)	1 (7.1)	29.17 (18)	0.046
	Composite	7 (29.2)	10 (41.7)	0 (0)	2 (8.3)	0 (0)	5 (20.8)	0 (0)		
L2	Loop	29 (26.1)	31 (27.9)	2 (1.8)	11 (9.9)	3 (2.7)	33 (29.7)	2 (1.8)		
	whorl	14 (17.1)	31 (37.8)	5 (6.1)	9 (11)	0 (0)	20 (24.4)	3 (3.7)		
	Arch	15 (36.6)	19 (46.3)	0 (0)	2 (4.9)	0 (0)	5 (12.2)	0 (0)	29.58 (18)	0.042
	Composite	2 (11.1)	11 (61.1)	1 (5.6)	1 (5.6)	0 (0)	2 (11.1)	1 (5.6)		
L3	Loop	40 (23.8)	64 (38.1)	5 (3)	11 (6.5)	2 (1.2)	42 (25)	4 (2.4)		
	whorl	15 (24.6)	19 (31.1)	2 (3.3)	6 (9.8)	1 (1.6)	17 (27.9)	1 (1.6)		
	Arch	4 (40)	3 (30)	0 (0)	2 (20)	0 (0)	1 (10)	0 (0)	20.69 (18)	0.295
	Composite	1 (7.7)	6 (46.2)	1 (7.7)	4 (30.8)	0 (0)	0 (0)	1 (7.7)		
L4	Loop	25 (20)	45 (36)	3 (2.4)	8 (6.4)	3 (2.4)	37 (29.6)	4 (3.2)		
	whorl	27 (25.2)	40 (37.4)	5 (4.7)	13 (12.1)	0 (0)	20 (18.7)	2 (1.9)	19.02 (18)	0.391
	Arch	5 (55.6)	1 (11.1)	0 (0)	1 (11.1)	0 (0)	2 (22.2)	0 (0)		

	Composite	3 (27.3)	6 (54.5)	0 (0)	1 (9.1)	0 (0)	1 (9.1)	0 (0)		
L5	Loop	46 (23.2)	76 (38.4)	5 (2.5)	18 (9.1)	3 (1.5)	44 (22.2)	6 (3)		
	whorl	9 (23.1)	10 (25.6)	2 (5.1)	3 (7.7)	0 (0)	15 (38.5)	0 (0)		
	Arch	1 (25)	1 (25)	0 (0)	1 (25)	0 (0)	1 (25)	0 (0)	14.67 (18)	0.684
	Composite	4 (36.4)	5 (45.5)	1 (9.1)	1 (9.1)	0 (0)	0 (0)	0 (0)		

Table 2b showed Right hand fingers(R1,R4 and R5) has significant association with blood groups of p value less than 0.05.

Table 2b Right fingerprint patterns association with blood groups

Finger Type	Pattern	Blood Group							Statistics	
		A+ve	B+ve	B-ve	AB+ve	AB-ve	O+ve	O-ve	Chi-Square (df)	P-value
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
R1	Loop	26 (21.7)	45 (37.5)	1 (0.8)	8 (6.7)	1 (0.8)	37 (30.8)	2 (1.7)		
	whorl	23 (23.7)	32 (33)	6 (6.2)	9 (9.3)	1 (1)	22 (22.7)	4 (4.1)	33.94 (18)	0.013
	Arch	6 (66.7)	3 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		
	Composite	5 (19.2)	12 (46.2)	1 (3.8)	6 (23.1)	1 (3.8)	1 (3.8)	0 (0)		
R2	Loop	26 (22.8)	41 (36)	2 (1.8)	12 (10.5)	3 (2.6)	28 (24.6)	2 (1.8)		
	whorl	23 (23.2)	35 (35.4)	5 (5.1)	9 (9.1)	0 (0)	24 (24.2)	3 (3)	14.69 (18)	0.683
	Arch	5 (31.3)	9 (56.3)	0 (0)	0 (0)	0 (0)	1 (6.3)	1 (6.3)		
	Composite	6 (26.1)	7 (30.4)	1 (4.3)	2 (8.7)	0 (0)	7 (30.4)	0 (0)		
R3	Loop	33 (20.6)	66 (41.3)	3 (1.9)	12 (7.5)	3 (1.9)	39 (24.4)	4 (2.5)		
	whorl	25 (32.5)	20 (26)	5 (6.5)	9 (11.7)	0 (0)	16 (20.8)	2 (2.6)	25.18 (18)	0.12
	Arch	2 (20)	5 (50)	0 (0)	2 (20)	0 (0)	1 (10)	0 (0)		
	Composite	0 (0)	1 (20)	0 (0)	0 (0)	0 (0)	4 (80)	0 (0)		
R4	Loop	31 (23)	51 (37.8)	1 (0.7)	16 (11.9)	2 (1.5)	33 (24.4)	1 (0.7)		
	whorl	23 (25.3)	30 (33)	5 (5.5)	6 (6.6)	1 (1.1)	21 (23.1)	5 (5.5)	34.43 (18)	0.011
	Arch	6 (37.5)	4 (25)	0 (0)	0 (0)	0 (0)	6 (37.5)	0 (0)		
	Composite	0 (0)	7 (70)	2 (20)	1 (10)	0 (0)	0 (0)	0 (0)		
R5	Loop	28 (24.1)	44 (37.9)	3 (2.6)	10 (8.6)	1 (0.9)	26 (22.4)	4 (3.4)		
	whorl	27 (24.3)	33 (29.7)	5 (4.5)	13 (11.7)	0 (0)	31 (27.9)	2 (1.8)	43.97 (18)	0.001
	Arch	0 (0)	10 (90.9)	0 (0)	0 (0)	0 (0)	1 (9.1)	0 (0)		
	Composite	5 (35.7)	5 (35.7)	0 (0)	0 (0)	2 (14.3)	2 (14.3)	0 (0)		

Table3a shows left hand finger prints patterns association with gender in which L1 is significantly associated with gender.

Table 3a shows Left Hand fingerprint pattern association with gender

Finger Type	Pattern	Gender Male N (%)	Female N (%)	Statistics Chi-Square (df)	P-value	Statistics Chi-Square (df)	P-value
L1	Loop	75(57.3)	56(42.7)	2.01 (3)	0.569	8.45 (3)	0.038
	whorl	48(57.8)	35(42.2)				
	Arch	7(50)	7(50)				
	Composite	17(70.8)	7(29.2)				
L2	Loop	60(54.1)	51(45.9)	1.85 (3)	0.603	3.05 (3)	0.384
	whorl	51(62.2)	31(37.8)				
	Arch	24(58.5)	17(41.5)				
	Composite	12(66.7)	6(33.3)				
L3	Loop	91(54.2)	77(45.8)	3.71 (3)	0.294	1.97 (3)	0.579
	whorl	40(65.6)	21(34.4)				
	Arch	7(70)	3(30)				
	Composite	9(69.2)	4(30.8)				
L4	Loop	71(56.8)	54(43.2)	1.32 (3)	0.724	1.24 (3)	0.744
	whorl	62(57.9)	45(42.1)				
	Arch	6(66.7)	3(33.3)				
	Composite	8(72.7)	3(27.3)				
L5	Loop	112(56.6)	86(43.4)	3.40 (3)	0.333	2.22 (3)	0.529
	whorl	24(61.5)	15(38.5)				
	Arch	4(100)	0(0)				
	Composite	7(63.6)	4(36.4)				

Table 3b shows right hand fingerprint patterns association with gender, in which R1 has significant association with gender.

Table 3b shows right fingerprints patterns association with gender

Finger Type	Pattern	Gender Male N (%)	Female N (%)	Statistics Chi-Square (df)	P-value
R1	Loop	59(49.2)	61(50.8)	8.45 (3)	0.038
	whorl	65(67)	32(33)		
	Arch	5(55.6)	4(44.4)		
	Composite	18(69.2)	8(30.8)		
R2	Loop	60(52.6)	54(47.4)	3.05 (3)	0.384
	whorl	62(62.6)	37(37.4)		
	Arch	11(68.8)	5(31.3)		
	Composite	14(60.9)	9(39.1)		
R3	Loop	89(55.6)	71(44.4)	1.97 (3)	0.579
	whorl	48(62.3)	29(37.7)		
	Arch	6(60)	4(40)		
	Composite	4(80)	1(20)		
R4	Loop	76(56.3)	59(43.7)	1.24 (3)	0.744
	whorl	57(62.6)	34(37.4)		
	Arch	9(56.3)	7(43.8)		
	Composite	5(50)	5(50)		
R5	Loop	63(54.3)	53(45.7)	2.22 (3)	0.529
	whorl	68(61.3)	43(38.7)		
	Arch	6(54.5)	5(45.5)		
	Composite	10(71.4)	4(28.6)		

Discussion

A loop fingerprint pattern was found in 54.68% of students' fingertips, followed by a whorl fingerprint pattern in 33.66%. similarly in our study males were more than females with a prevalence of 147(58.33%) and 105(41.67%). The blood group had a strong link with fingerprints of the 1st, 4th and 5th right fingers and the 1st, 2nd left fingers, but gender had significant association with Ist left and Ist right fingers. Nigerian research of 490 participants found that 51.8% were male, indicating male dominance.[13] A local Abbottabad research found 62% of men, similar to this study. [14]

Loop was the most common finger pattern in students with 54.68%, followed by whorl 33.66% and least common was arch 5.55%. In a study of Nepal, loop fingerprints were most common (52.71%) while whorl fingerprints were second (27.38%) and in contrast least common was composite.[15]Another study have similar results as in our study with loop pattern 51.76% and 43% whorl fingerprints. [16] Study which have same results as our study were conducted in Abbottabad in Pakistan. [14]

Our study showed that Ist right and Ist left fingers had significant association with gender while all other fingers of both hands not significant. Study in which fingerprint pattern was weakly associated with gender was.[17] Another study revealed significant association between the Fingerprint pattern, Gender and ABO blood group. [18] A study conducted in India revealed that there was no significant association between fingerprint patterns and gender. [19] Also a study conducted by Joshi et al, showed that there was a significant association between fingerprints patterns, gender and blood groups.[20]

Our study revealed significant association between left hand fingers (L1 and L2) and right hand fingers (R1,R4 and R5) with blood groups. A study in India showed significant association between fingerprint patterns and blood group($P<0.05$).[19] A study conducted in libya revealed that there was no significant association between fingerprint patterns and blood group and gender.[21]

Another study conducted on Libya students revealed potential association between fingerprint patterns and blood groups and significant correlations between specific fingerprint types and blood groups.[22]

Conclusion

The study concludes that the Loop fingerprint is the most prevalent fingerprint among Medical Students, followed by the Whorl fingerprint. In fingerprint relationship statistics, blood types were significant for the Ist, 4th and 5th right fingers and 1st and 2nd left fingers while gender was significant for R1 and L1 fingers.

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