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The Occurrences of Symmetrical and Asymmetrical Papillary Patterns on the Brahmins of Rajasthan

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Dermatoglyphicists have devoted much of their time, energy and efforts to the study of the ridged skin of the body. Especially so when the modern Scientific techniques have developed it into the field of forensic science. Among the regions of ridged skin e. g. Finger, Palms, Toes, & Soles — the Fingers have been the focus of attraction of study because of many evident reasons. Firstly it is easy to take the finger prints of the subjects as compared to other regions. Moreover these finger prints can lead to more tentative conclusions than is the case with palms or soles. Anthropologists have always tried to establish the racial positions of those innumerable races mankind as are inhabiting this planet of earth.

Introduction

During the month of January 1960 the author visited a town named Kankroli which is about 40 miles away from Udiapur (Rajasthan). The data on finger dermatoghyphics was collected on the Brahmins. All the persons are represented by bilateral hands. The data was collected from Kanya Pathshalla and Boys Middle school.

Physical Features

The conspicuous diversity in an Indian population is one of its caste system. Because of many evident reasons, the Brahmins occupy the highest position in its population. He is considered to be pure and superior because he is fountain of knowledge and is endowed with intellectual and spiritual capabilities. He directs all the fairs and festivals in the daily life of people and is considered to be an emissary of God.

In their physical features they conform to the prevalent Mediterranean type, i. e. medium stature, light complexion and long heads. They have long face and long nose and form a very conservative group. They have tried always to keap their purity of blood by marrying among themselves only, thus forming an endogamous group.

Methods and Material

The data in this papar are represented by 70 males and 70 females. Every individual is represented by the fingers of both the hands. The methods employed in the analysis of the various patterns on the digits are as described by Wilder.

In the present analysis no differentiation between Ulnar and Radial loops is made and they are taken in the category of Loops. The frequencies of all possible combinations — both symmetrical and asymmetrical — is determined separately for various pairs of corresponding digits. These frequencies are found by counting only (actual frequencies AF). Besides the frequencies of various combinations — which would have been met with — had their distribution been determined by chance (chance frequencies CF). AF/CF ratio for each combination and for various pairs of corresponding digits have been calculated (AF-CF ratio).

Analysis

So far attempts have been made to ascertain the percentile frequencies of various patterns as analysed on the various groups. Little or no attention is given to probe into the symmetry of the pattern occuring on the homologous Right and Left digits of the hands. It has been noticed that there exists a tendency of symmetrical patterns to exhibit itself on the corresponding digits of Right & Left hands, although the asymmetrical patterns on the corresponding digit are not uncommon.

This table lists the various patterr combinations on the corresponding digits of Right and Left hands in both the sexes. It is generally accepted that whorls and Arches occupy two extreme positions with the Loop in intermediate. The pattern combinations of whorls with Whorls are most common. While the combination of Arches with Whorls & Loops are few.

Tab. 1. Percentile frequencies of various pattern combination on the corresponding digits of right & left hands in Brahmin series (70 males & 70 females)

R/L Combination	Males					Females				
	I	II	III	IV	V	I	II	III	IV	V
W/W	44.28	34.28	15.71	57.14	15.71	38.57	34.28	15.71	45.71	12.85
W/U	11.43	11.43	4.28	7.14	7.14	8.57	10.00	7.14	10.00	7.14
W/A	0.00	0.00	0.00	0.00	0.00	1.43	0.00	1.43	0.00	0.00
U/W	12.85	10.00	17.14	10.00	12.85	10.00	7.14	10.00	12.85	20.00
U/U	22.85	27.14	51.43	21.43	61.43	37.14	41.43	58.57	25.71	55.71
U/A	1.43	8.57	5.71	2.85	1.43	1.43	4.28	4.28	1.43	1.43
A/W	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A/U	4.28	0.00	0.00	0.00	0.00	1.43	0.00	0.00	2.85	1.43
A/A	2.85	7.14	5.71	1.43	1.43	1.43	2.85	2.85	1.43	1.43
Total	99.97	99.99	99.98	99.99	99.99	100.00	99.98	99.98	99.98	99.99

Males in general exhibit a more no. of pattern combination W/W in all of their digits — the highest being on fourth digit in either of sexes. Whereas females compared to males show a more no: of patterns combination U/U in all of first four digits. While the frequency of this pattern in fifth digit is more in males 61.43% than in the same digit of females 55.71%.

Taking each digit separately it is observed that on the first digit the combination W/W exceed in males 44.28% compared to 38.57% on the same digits of females The next pattern combination of the common occurence is U/U which predominates in females 37.14% as compared to 22.85% in males. The pattern combination W/A is absent in males, While it is present only 1.43% on the females. Similarily the pattern combination A/A is rare, Showing as much as double the frequency in males as it is on females.

Comparing the second digit of males and females it is observed that the pattern combination W/W is of an equal frequency 34.28% in either of the sexes. The next common type of pattern comination U/U for exceeds in females 41.43% as compared to 27.14% in males. Among the rare type of pattern combinations A/A males predominate showing it to be 7.14% as compared to 2.85% in females.

It is the third digit which — unlike the first and second digit — exhibit the preponderance of pattern combination U/U. Its frequency exceeds in famales 58.57% as compared to 51.43% in males. The frequency of comination W/W is considerably reduced in this digit-showing it to be 15.71% on either of the sexes while the rare pattern combination A/A shows as much as twice the frequency in males 5.71% as is found on females 2.85%.

Digit fourth perhaps exhibits the highest no. of pattern combination W/W than any other combination in both the sexes. Males preponderate in its frequency 57.14% as compared to 45.71% in females. Hence surmising towards a symmetry to the highest degree among the males than females. But the pattern combination U/U is less in males 21.43% as compared to 25.71% in females. Among the rare combination A/W is absent in males on this digit, whereas it is completely absent from all the digits of females.

The fifth digit-like third-exhibits the preponderance of U/U pattern combination. This combination in both the sexes exhibits perhaps the highest frequency than-any combination on all the digits. It far exceeds on males 61.43% as compared to 55.71% in females — exhibiting thereby a symmetry of a greater degree in males than is in females. There is an abrupt decline of the pattern combination W/W in-both the sexes. Females show the least frequency 12.85% as compared to 15.71% in males. The pattern comination U/W exhibits as much as double the frequency in females 20.0% as in males 10.0%.

In a general perusal of this table it is quite evident that the whorls preponderate on I, II and IV digits in both the sexes. While loops are more oftenly observed on III and V digits in both the sexes. The Arches are more common on males than in females, moreover the Arches are more frequently noticed on the II & III digit in both the sexes.

Tab. II. Occurrence of Symmetrical Combinations between Whorls and Whorls in Brahmin series (70 males & 70 females)

digit	Males			Females		
	AF	CF	AF/CF ratio	AF	CF	AF-CF ratio
I	44.28	34.90	1.27	38.57	23.56	1.63
II	34.28	20.89	1.64	34.28	18.39	1.86
III	15.71	7.02	2.23	15.71	6.24	2.51
IV	57.14	41.82	1.36	45.71	32.63	1.40
V	15.71	6.50	2.41	12.85	6.57	1.95
			Mean 1.782			Mean 2.070

Symmetry in Whorls

This table relates the figures for symmetrical occurences of whorls in both the sexes of Brahmins series. In males the range of AF/CF ratio is from 1.27 to 2.23 while females exhibit it to be 1.40 to 2.51. It is also observed that this ratio is inversely proportionate to CF., i. e. lesser the value of CF. more comes to value of AF/CF ratio.

Tab. III. Occurence of Symmetrical combinations between Loops & Loops in Brahmins Series (70 males & 70 females)

digit	Males			Females		
	AF	CF	AF-CF ratio	AF	CF	AF-CF ratio
I	22.85	14.33	1.59	37.14	23.56	1.58
II	27.14	17.69	1.53	41.43	27.17	1.52
III	51.43	40.59	1.27	58.57	47.87	1.22
IV	21.43	9.79	2.19	25.71	15.43	1.66
V	61.43	51.92	1.18	55.71	49.48	1.13
			Mean 1.552			Mean 1.420

Symmetry in Loops

This table indicates the figures for symmetrical occurence of Loops in both the sexes of the Brahamins. In males the range of AF/CF is from 1.27. to 2.19, while in females it is from 1.13. to 1.66. It is also noticed that with the decrease of value of CF, the value of AF/CF ratio increases.

Tab. IV. Occurrence of Symmetrical combination between Arches & Arches in Brahmin series (70 males & 70 females).

digit	Males			Females		
	AF	CF	AF-CF ratio	AF	CF	AF-CF ratio
I	2.85	0.30	9.50	1.43	0.08	18.88
II	7.14	1.36	5.25	2.85	0.20	14.25
III	5.71	0.65	8.78	2.85	0.24	11.91
IV	1.43	0.06	23.33	1.43	0.12	11.91
V	1.43	0.04	35.75	1.43	0.08	18.88
			Mean 16.520			Mean 15.166

Symmetry in Arches

This table exhibits the figures for symmetrical occurrences of Arches in both the sexes of Brahmins. In males the range of AF/CF ratio in from 5.25 to 35.75, while in females it it from 11.91 to 18.88. AF/CF ratio is inversely proportionate ot the value of CF.

Comparison of Symmetry in Whorls, Loops & Arches

Comparing the values of AF/CF ratio for whorls, Loops & Arches in both the sexes, it is noticed that Loops exhibit the lowest value, while the Arches — the highest. Hence it can certainly be inferred that the tendency to symmetrical occurence is highest in Arches, lower in Whorls and lowest in Loops.

A degree to the tendency to the occurrence of symmetrical pattern on the digits of corresponding Right and Left hands can be evaluated from the mean value of AF/CF. In the mean value of this ratio of pattern combination Arch and Arch — the males exceed showing it to be 16.520 as compared to 15.166 in females. It has already been mentioned that this combination shows the highest value of AF/CF ratio. The mean value of pattern combination Whorl Whorl far exceeds in females showing it to be 2.070 as compared to 1.782 in males. While the mean value of the pattern combination Loop & Loop is definitely more in males 1.552 as compared to 1.420 in females. It has already been mentioned that this combination in general show the least value as compared to the other pattern combinations mentioned above.

Tab. V. Occurrence of asymmetrical Combinations between Loops and Arches in Brahmin series

Digit Combination		Males			Females		
		AF	CF	AF-CF ratio	AF	CF	AF-CF ratio
I	Loop-Arch	1.43	1.59	0.89	1.43	1.38	1.03
	Arch-Loop	4.28	2.75	1.55	1.43	1.38	1.03
II	Loop-Arch	8.57	7.18	1.19	4.28	3.77	1.13
	Arch-Loop	0.00	3.31	0.00	0.00	1.46	0.00
III	Loop-Arch	5.71	8.33	0.69	4.28	6.24	0.68
	Arch-Loop	1.87	2.52	0.74	0.00	1.87	0.00
IV	Loop-Arch	2.85	1.47	2.00	1.43	1.14	1.25
	Arch-Loop	0.00	0.41	0.00	2.85	1.65	1.72
V	Loop-Arch	1.43	2.16	0.66	1.43	2.19	0.65
	Arch-Loop	0.00	0.98	0.00	1.43	1.83	0.78
				Mean 0.770			Mean 0.827

Asymmetrical Combinations of Loops & Arches

This table indicates the figures for asymmetrical occurrence of Loops & Arches and those of Arches & Loops. In General the mean value of AF/CF ratio is more in females i. e. 0.827 as compared to 0.770 in males. The range of this value in males

Tab. VI. Occurrence of asymmetrical combinations between Loops and Whorls in Brahmin Series

Digit Combination		Males			Females		
		AF	CF	AF-CF ratio	AF	CF	AF-CF ratio
I	Loop-Whorl	12.85	21.22	0.60	10.00	23.56	0.42
	Whorl-Loop	11.43	21.49	0.53	8.57	23.56	0.37
II	Loop-Whorl	10.00	20.89	0.48	7.14	29.90	0.24
	Whorl-Loop	11.43	17.63	0.65	10.00	22.78	0.44
III	Loop-Whorl	17.14	23.93	0.71	10.00	18.73	0.53
	Whorl-Loop	4.28	11.94	0.36	7.14	16.18	0.44
IV	Loop-Whorl	10.00	23.01	0.43	12.85	23.43	0.54
	Whorl-Loop	7.14	18.36	0.39	10.00	21.49	0.58
V	Loop-Whorl	12.85	21.63	0.59	20.00	25.34	0.79
	Whorl-Loop	7.14	15.67	0.45	7.14	12.85	0.55
				Mean 0.519			Mean 0.490

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is from 0.00 to 2.00 while it is from 0.00 to 1.72 in females. From these values it can be inferred that there exist a slight tendency of repulsion between Loops & Arches.

Asymmetrical Combination of Loops & Whorls

This table relates the figures for asymmetrical occurrence of Loops & Whorls and Whorls & Loops. The mean value of AF/CF is more in males 0.519 as compared to 0.490 in females. Its range in males is from 0.36 to 0.71 while in females it ranges from 0.24 to 0.79.

Tab. VII. Occurrence of asymmetrical combinations between Whorls & Arches in Brahmin Series

Digit Combination	Males			Females		
	AF	CF	AF-CF ratio	AF	CF	AF-CF Ratio
I Whorl-Arch	0.00	2.38	0.00	1.43	1.39	1.03
Arch-Whorl	0.00	4.08	0.00	0.00	1.39	0.00
II Whorl-Arch	0.00	7.18	0.00	0.00	3.16	0.00
Arch-Whorl	1.43	3.92	0.36	0.00	1.18	0.00
III Whorl-Arch	0.00	2.44	0.00	1.43	2.08	0.68
Arch-Whorl	0.00	1.88	0.00	0.00	0.73	0.00
IV Whorl-Arch	0.00	2.75	0.00	0.00	1.47	0.00
Arch-Whorl	0.00	0.86	0.00	0.00	2.50	0.00
V Whorl-Arch	0.00	0.65	0.00	0.00	0.57	0.00
Arch-Whorl	0.00	0.41	0.00	0.00	0.68	0.00
			Mean 0.036			Mean 0.171

Asymmetrical Combination of Whorls & Arches

This table exhibits the figures for asymmetrical occurrence of whorls & Arches and Arches & Whorls. These pattern combinations are unique in their AF/CF value. Most of the combinations show it to be 0.00. In males it ranges from 0.00 to 0.36 while in females it is from 0.00 to 1.03. The mean value of AF/CF is exhibited more in females 0.171 as compared to 0.036 in males. This least mean value of 0.036 in males makes it quite understandable that the tendency to repulse this pattern combinations is most in males as compared to females.

Comparison of Various Asymmetrical Combinations

The least value in the table V, VI and VII indicates that there is a tendency to repulsion of the various asymmetrical combination. The combination Whorl-Arch and Arch-Whorl show the lowest value, while the combination Loop-Arch and Arch-

Loop exhibit the highest. Hence it can certainly be said that tendency to repulsion is more in Loop-Arch, most in Whorl-Arch with an intermediate in Loop-Whorl combination.

Summary

It is to assess the occurrence of symmetrical and asymmetrical combinations of papillary patterns on the Brahmins of Rajasthan (both the sexes) that this paper has been attempted. Symmetrical combinations are those patterns which are of the same type on the corresponding digits of Right and Left hands, while the asymmetrical are those which are of different types on the digits of corresponding Right and Left hands. All the Loops whether Ulnar or Radial are put into one category. The actual frequencies (AF) and chance frequencies (CF) of Various combinations are calculated.

1. The pattern combination W/W preponderate on I, II, & IV digits in both the sexes, while U/U is more often observed on the III and V digits. The pattern combination A/A is more common in males than in females, moreover this combination is more frequently noticed on II and III digits only.

2. Comparing the values of AF/CF ratio for the symmetrical combination of Whorls-Whorls, Loops-Loops and Arches-Arches in Brahmin series it is observed that the combination Loops-Loops exhibit the lowest value, while the Arches-Arches show the highest, indicating thereby that the tendency to symmetrical patterns is highest in Arches, lower in Whorls and lowest in Loops.

3. The least AF-CF value in the various asymmetrical combination shows the tendency to the repulsion of the combination. It is observed that this tendency is highest in Whorl-Arch and lowest in Loop-Arch combination.

4. A strong tendency to repulsion on the part of asymmetrical patterns is observed and which consequently increases the tendency more towards the symmetrical patterns.

5. The value of AF/CF ratio is inversely proportionate to the value of chance frequency (CF) or in other words the decrease of CF value increases the AF/CF ratio

6. It is possible to calculate the chance frequencies (CF) when the percentile frequencies of various patterns are given.

Acknowledgements

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RIASSUNTO

Questo lavoro è stato scritto al fine di stabilire la frequenza delle combinazioni simmetriche ed asimmetriche dei caratteri papillari dei Bramini di ambedue i sessi del Rajastan. Le combinazioni simmetriche sono quei caratteri che sono dello stesso tipo sulle dita corrispondenti delle mani sinistra e destra, mentre quelle asimmetriche sono quelli di tipo differente. Tutte le anse, sia ulnari che radiali, vengono messe in una sola categoria. Vengono calcolate le frequenze reali (AF) e le frequenze casuali (CF) delle diverse combinazioni.

1) La combinazione W/W è più frequente nel I, II e IV dito in ambedue i sessi, mentre la combinazione U/U è più frequente nel III e nel V dito. La combinazione A/A è più frequente nei maschi che nelle femmine ed è riscontrata con una certa frequenza soltanto nel II e nel III dito.

2) Paragonando i valori della proporzione AF/CF per la combinazione simmetrica di vorticilli/vorticilli, anse/anse ed archi/archi nella serie di Bramini si nota che la combinazione anse/anse è quella con il valore più basso, mentre la combinazione archi/archi ha il valore più alto, il che sta a indicare che la tendenza alla simmetria è maggiore negli archi, minore nei vorticilli ed ancora minore nelle anse.

3) Il valore minimo AF-CF delle varie combinazioni asimmetriche tende a respingere la combinazione. Si nota che questa tendenza è maggiore nella combinazione vorticillo/arco e minima in quella ansa/arco.

4) Si nota una forte tendenza a respingere i caratteri asimmetrici il che, di conseguenza, aumenta la tendenza verso i caratteri simmetrici.

5) Il valore del rapporto AF/CF è inversamente proporzionale al valore della frequenza casuale (CF) o in altre parole la diminuzione del valore CF aumenta il rapporto AF/CF.

6) È possibile calcolare le frequenze casuali (CF) quando siano date le frequenze percentuali dei vari caratteri.

RÉSUMÉ

Ce travail a été écrit dans le but d'établir la fréquence des combinations symétriques et asymétriques des caractères papillaires des Brahmins des deux sexes du Rajastan. Les combinations symétriques sont ces caractères qui sont du même type sur les doigts correspondants des mains droite et gauche, tandis que les combinations asymétriques sont de type différent. Les anses, qu'elles soient cubitales ou radiales, sont indiquées dans une seule classe. L'on calcule les fréquences réelles (AF) et les fréquences casuelles (CF) des différentes combinations.

1) La combination W/W est plus fréquente sur le Ier, IIème & IVème doigt chez les deux sexes, tandis que la combination U/U est plus fréquemment observée sur le IIIème et IV^{ère} doigt. La combination A/A est plus fréquente chez les mâles que chez les femelles et, en outre, elle est plus fréquemment observée sur le IIème et le IIIème doigt.

2) En comparant les valeurs du rapport AF/CF pour la combination symétrique tourbillons/tourbillons, anses/anses et arcs/arcs chez les séries de Brahmins, l'on observe que la combination anses/anses présente la valeur inférieure, tandis que la combination arcs/arcs présente la valeur la plus élevée. Ceci indique qu'il y a plus de tendance à la symétrie dans les arcs, qu'il y a en moins dans les tourbillons et encore moins dans les anses.

3) La valeur inférieure AF/CF des diverses combinations asymétriques repousse la combination. L'on remarque que cette tendance est plus forte dans la combination tourbillon/arc et plus petite dans la combination anse/arc.

4) L'on remarque une forte tendance contre les caractères asymétriques, ce qui augmente, par conséquent, la tendance vers les caractères symétriques.

5) La valeur du rapport AF/CF est inversement proportionnelle à la valeur de la fréquence casuelle (CF), ou, autrement dit, la diminution de la valeur CF augmente le rapport AF/CF.

6) Il est possible de calculer les fréquences casuelles (CF) si l'on connaît les fréquences en pourcentages des divers caractères.

ZUSAMMENFASSUNG

Das Ziel vorliegender Arbeit ist es, das Vorkommen symmetrischer und asymmetrischer Kombinationen von Fingerkuppenzeichnungen bei den Brahmanen von Rajasthan beiderlei Geschlechts aufzuzeigen. Als symmetrische Kombinationen gelten gleichartige Zeichnungen an den entsprechenden Fingern der rechten und linken Hand, während verschiedenartige Zeichnungen an den entsprechenden Fingern der rechten und linken Hand als asymmetrisch betrachtet werden. Alle Schleifen, sowohl radiale als ulnare, wurden in einunddieselbe Kategorie genommen. Berechnet wurde die effektive Häufigkeit (AF = actual frequency) sowie die Zufallshäufigkeit (CF = chance frequency) der verschiedenen Kombinationen.

1) Die Zeichnungskombination W/W wiegt bei beiden Geschlechtern am 1., 2. und 4. Finger vor, während U/U öfters am 3. und 4. Finger beobachtet wird. Die Kombination A/A ist mehr bei männlichen als bei weiblichen Individuen anzutreffen und befällt meistens nur den 2. und 3. Finger.

2) Bei einem Vergleich des AF/CF = Quotienten für die symmetrische Kombination von Wirbel/Wirbel, Schleifen/Schleifen und Bögen/Bögen in der Brahmanenserie wurde bemerkt, dass der Wert bei der Kombination Schleifen/Schleifen am niedrigsten, bei der Kombination Bögen/Bögen hingegen am höchsten war. Somit zeigt sich, dass die Tendenz für symmetrische Zeichnungen bei den Bögen am höchsten, bei den Wirbeln weniger stark und bei den Schleifen am niedrigsten ist.

3) Den niedrigsten AF/CF = Quotienten in den verschiedenen asymmetrischen Kombinationen zeigte die Tendenz zur Abneigung gegen eine Kombination. Es wurde beobachtet, dass diese Tendenz bei der Kombination Wirbel/Bögen am höchsten und bei der Kombination Schleifen/Bögen am niedrigsten ist.

4) Seitens der asymmetrischen Zeichnungen bemerkt man eine starke Tendenz zur Abneigung, wodurch die Tendenz für symmetrische Zeichnungen erhöht wird.

5) Der Wert des Quotienten AF/CF ist umgekehrt proportionell zum Wert der Zufallshäufigkeit (CF), oder, in anderen Worten: die Verringerung des Wertes von CF erhöht den Quotienten AF/CF.

6) Es ist möglich, die Zufallshäufigkeiten zu berechnen, wenn die prozentuellen Häufigkeiten der verschiedenen Zeichnungen bekannt sind.