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STUDY ON FINGER DERMATOGLYPHICS OF BRAHMIN AND MUSLIM POPULATIONS IN MANIPUR: A COMPARATIVE STUDY

***[1]Mangsatabam Shyamchand Meitei and [2]Sorojini Devi, H.**

[1]Assistant Professor, Department of Anthropology, D.M. College of Science, Imphal, 795001, Manipur
[2]Nambol L. S. College, Nambol, Manipur Former Assoc. Professor D.M. College of Science, Imphal, 795001, Manipur

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ABSTRACT

Background: Dermatoglyphic study is the study of dermal ridges on the palmar and planter surfaces of the feet and hand. The study of fingerprints is considered as the best tool for identification in living and even dead bodies and play important role in the field of forensic medicine. ***Objectives:*** The objective of the present study is to study the fingerprints patterns, various indices and ridge density of Brahmin and Muslim populations in Manipur. ***Design*****:** A Cross-sectional study. ***Materials and methods*****:** A total of 400 unrelated normal individuals (200 = Brahmins and 200 =Muslims) representing males (100) and females (100) in each population were collected using ink-print method. The age of the subjects ranges from 10 to 40 years. ***Results*****:** Loop finger patterns are dominant among males and females with 57.95% among Brahmins and 51.55% among Muslims which confirm the global distribution of whorl, loop and arch patterns. Among the Bishnupriyas of Assam and Khangabok, such higher occurrences of loops were recorded, which may suggest having similar origin with the present study population. This is closely followed by whorls with 34.55% among Brahmins and 44.355 among Muslims. Comparison of finger patterns of the same sex in the two populations showed highly significant differences, statistically, (λ^2= 36.82, 18.87 and 51.92, P<0.05) level. Furuhata's Index is higher among the Muslims while Dankmeijer's and Poll's indices were higher among the Brahmins. Muslim males had the highest mean pattern intensity index, Absolute Ridge Count and Total Ridge Count in comparison with Brahmin males, as such, significant differences have revealed in the comparisons of the three parameters in between the two groups. Interestingly, such significant variations cannot be seen in the female populations of the two groups. ***Conclusion*****:** Differences in digital patterns between Brahmins and Muslims in loops, whorls and arches have been assessed. Moreover, pattern intensity index, absolute ridge count and total ridge count were also found to be different in between the males, in particular.

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INTRODUCTION

The most distinctive feature of the palmar and plantar skin is the presence of fine ridges and furrows. This ridge or friction skin prevents slipping of hand and feet while grasping and in locomotion (a special characteristic of the primate). The parallel lines of ridges are curved rather than straight and that in certain parts they are arranged in the form of patterns. The study of dermal-ridged skin arrangements is known as dermatoglyphics (Holt, 1961). In 1926, Cummins and Midlo proposed the word 'Dermatoglyphic' meaning derma-skin and glyphic- carve.

Corresponding author: **Mangsatabam Shyamchand,**
Assistant Professor, Department of Anthropology, D.M. College of Science, Imphal, 795001, Manipur.

Dermatoglyphic characters remain permanent and unchanged in the later life unless destroyed by extreme environmental stress (Cummins & Midlo, 1961). The of most dermatoglyphical features conforms to a polygenic system with individual genes contributing a small adaptive effect (Holt, 1968). The configuration types are individually variable, but they vary within limits, which allow for systematic classification. The analysis of quantitative and qualitative dermatoglyphic traits are employed widely in different populations and subpopulations for finding micro structural and similarities or differences between populations (Newman, 1960; Chai, 1972; Malhotra *et al*., 1980; Singh, 1991; Milicic & Pavao, 1991). Dermatoglyphic study can be linked with genetically determined diseases.

Table 1. Frequency distribution of digital patterns of both hands of Brahmins and Muslims

Popn	Sex	Pattern	Left					Right					Total
			I	II	III	IV	V	I	II	III	IV	V	
Brahmin	Male	Whorl	47	42	23	44	18	41	36	24	40	20	335
		Loop	52	46	74	53	78	55	52	67	53	76	606
		Arch	01	12	03	03	04	04	12	09	07	04	59
	Female	Whorl	49	36	20	47	17	55	39	32	47	14	356
		Loop	44	50	72	48	79	37	43	54	46	80	553
		Arch	07	14	08	05	04	08	18	14	07	06	91
Muslim	Male	Whorl	62	48	29	73	32	56	42	21	58	28	460
		Loop	35	43	66	27	67	41	47	72	41	69	509
		Arch	03	09	05	0	01	03	11	07	01	03	31
	'emale	Whorl	55	39	35	59	28.0	55	46	32	61	28	427
		Loop	44	52	64	40	71	40	46	62	36	68	522
		Arch	01	01	09	01	01	05	08	06	03	03	51
Grand Total													4000

Table 2. Combined Digital Patterns Irrespective of Sex of Two populations

Population	Pattern	Frequency (%)
Brahmin	Loop	1159 (57.95)
	Whorl	691 (34.55)
	Arch	150 (7.50)
	Total	2000 (100)
Muslim	Loop	1031(51.55)
	Whorl	887 (44.35)
	Arch	82 (4.10)
	Total	2000 (100)

The Finger patterns are almost certainly influenced by the interaction of several genes; thus, the ridge patterns are distinct and unique for every individual making it widely used as one of the tools for criminal identification worldwide (Ismail *et al*., 2009). Dentition and palate development occurs at the same period a development of dermal ridges, therefore, dermatoglyphic studies reported association between these two (Rama *et al*., 2013).It is considered a classical model of polygenic inheritance (several genes are involved in the inheritance (Holt, 1968) as well as a multi factorial trait (ridges can be counted as total ridge count (Penrose, 1969). According to Penrose (1969) seven genes are thought to be involved in the Finger print formation. In polygenic inheritance, the genes that confer this follow Mendel's laws, but together, they do not produce a single-gene phenotypic ratio. Instead, they all contribute to the phenotype without being dominant or recessive to each other. The present study is an attempt to envisage a comparative study of digital patterns between the Brahmin and Muslim Populations in Manipur. The Brahmins migrated mainly from Indian states primarily from Assam, Bengal, and Tripura and Muslims also entered into the Sovereign state of Manipur through Sylhet and Cachar districts of old Assam in the year 1606 as their last destination towards the eastern sector of the country (Singh, 1980). Intermarriages between the Brahmin and Muslim before and after their migration to Manipur never happened because of their strict religious boundaries. The male progenitors of these two migrant groups acquired female partners (wives) from the local autochthonous Manipuri community at the beginning (Singh, 1986; Shah, 1990). This marital relationship of the Meitei with the Brahmin and Muslim is of one-way direction.

Objective of the study: The objective of the present study is to study the fingerprints patterns, various indices and ridge density of Brahmin and Muslim populations in Manipur.

MATERIAL AND METHODS

In this present study, a sample size of unrelated 200=Brahmins and 200=Muslims representing 100 (males) and 100 (females) in each population were considered. The individual who have married from the other communities and their offsprings were not included.

Methodology: Finger prints were collected using ink-print rolling over method, which provides an inflated area for the display of the more important ridge impression in each finger pattern (Hoover, 2006). Digital Pattern type, Total Digital Ridge Count (TFRC), Absolute Digital Ridge Count (AFRC) were studied. Digital Patterns and Ridge count on each digit and two types of ridge counts were observed under a Finger print magnifier (Volotzkoy, 1936) and classified as per of Galton's three fold classification of whorl, loop and arch. The Total Ridge Count (TRC) and Absolute ridge count (AFRC) have been done following Holt (1968).

Statistical analysis: Mean ($\bar{x}$), Standard deviation (σ) and Standard error (S.E) were computed using SPSS version 16 and Chi- square and t- test were computed manually using fx - 82MS.

RESULTS

Table below displays frequency distribution of digital patterns of both hands of Brahmin and Muslim communities. Whorl finger patterns are most prevalent in digit 1 among the Brahmins whereas in digit IV for the Muslims, irrespective of hands and sex. Loops are most dominant in digit V, but exceptionally in digit III among the Muslim males. Arches are commonly present in digit II in both the populations. As an exception, Arch patterns show the highest frequency on digit II in both communities, but absent in the right hand digit IV of Muslim males (Table 1). Loops, Particularly, Ulnar loops (UL) are the most common fingerprint patterns in both males and females with 57.95% for Brahmins and 51.55% for Muslims, and followed by whorls with 34.55% and 44.35 % respectively. As a general trend, arches are found in least percentage, however, higher frequency of arches has been observed among Brahmins (7.5%) as compared with Muslims with 4.1% (Table 2).

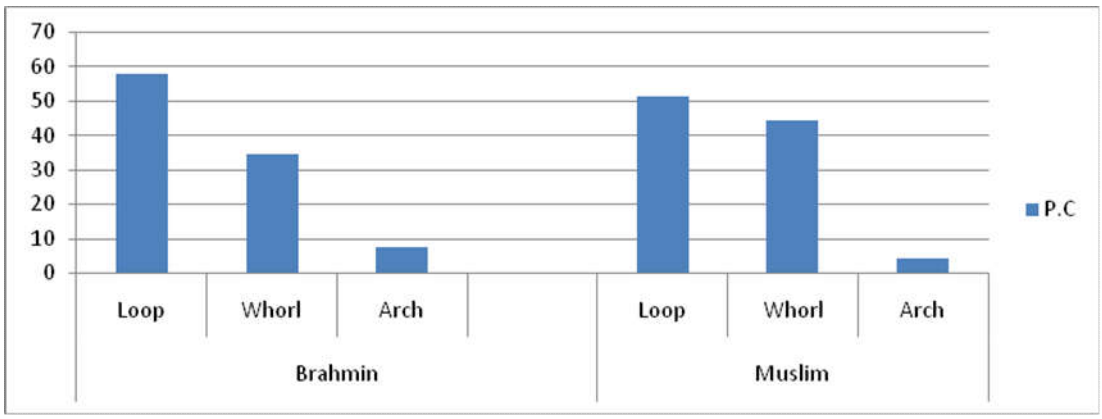

Fig. 1. Graph showing different percentages of digital patterns of Brahmin and Muslim

Table 3. Frequency Percentage distribution of Total Digital Patterns and λ^2 values

Population	Sex	Whorl	Loop		Arch	Total	λ^2
			UL	RL			
Brahmin	Male	335 (33.5)	583 (58.3)	23 (2.3)	59 (5.9)	1000	36.817*
Muslim	Male	460 (46.00)	489 (48.90)	20 (2.0)	31 (3.10)	1000	
Brahmin	Female	356 (35.6)	538 (53.8)	15 (1.5)	91 (9.1)	1000	18.874*
Muslim	Female	427 (42.70)	505 (50.50)	17 (1.7)	51 (5.1)	1000	
Brahmin	Total	691 (34.55)	1121 (56.05)	38 (1.9)	150 (7.5)	2000	51.915*
Muslim	Total	887 (44.35)	994 (49.70)	37 (1.85)	82 (4.1)	2000	

Note: d f = 3, λ^2=7.815, P<0.05 and figure in the parentheses indicate percentage.

Table 4. Furuhata, Dankmeijer and Poll Index of Brahmins and Muslims

Population	Sex	Furuhata's Index	Dankmeijer's Index	Poll's Index
Brahmin	Male	55.28	17.61	9.73
	Female	64.38	25.56	16.45
	Total	59.62	21.70	12.94
Muslim	Male	90.37	6.74	6.09
	Female	81.80	11.94	9.77
	Total	84.09	9.45	7.95

Table 5. Mean and't' Values of Pattern Intensity Index, Absolute Ridge Count and Total Ridge Count

Popul-ation	Sex	Pattern intensity Index (PII)		Absolute ridge count (ARC)		Total ridge count (TRC)	
		Mean ± SE	't' test	Mean ± SE	't' test	Mean ± SE	't' values
Brahmin	Male	12.44 ±0.38	3.095**	164.67 ± 7.95	2.519*	126.28± 4.04	2.275*
Muslim	Male	14.04 ± 0.35		191.01 ± 6.79		140.94 ±5.02	
Brahmin	Female	12.39 ± 0.45	1.827	163.78 ± 9.41	1.668	122.64 ± 5.23	1.693
Muslim	Female	13.49 ±0.40		184.93 ± 8.57		135.70 ± 5.67	

Note: d f =198, t= 1.96 * P< 0.05(significant). **P<0.01 (highly Significant)

Table 3 shows total digital patterns of different genders of Brahmins and Muslims. From the distribution pattern, it has been observed that Ulnar loop (UL) finger patterns are the most common in the highest frequencies in both sexes of the two groups with having least number of radial loops. Remarkably, the Brahmins have higher loop patterns in both males and females with 58.3% and 53.85 % respectively as compared to Muslims. On the other hand, the latter indicates higher frequencies of whorls 46.0% and42.70% for males and females than the Brahmins whose percentages are 33.5% and 35.6% for both sexes. Comparisons of digital patterns in between the two populations of the same genders shows highly significant differences, statistically, (λ^2= 36.82, 18.87 and 51.92, P<0.05) level (Table 3).

Table 4 highlights various index values. While observing these values, Furuhata's Index is found to be higher among the Muslims while Dankmeijer's and Poll's indices are higher among the Brahmins. From the table given below, it is observed that Muslim males have the highest mean pattern intensity index (14.04 ±0.35), absolute ridge count (191.01±6.79) and total ridge count (140.94±5.02) whereas the lowest means have been revealed among the Brahmins with 12.39± 0.45, 163.78 ±9.41 and 140.94 ± 5.02 respectively. Statistically, significant differences have been shown in the comparisons of PII (t=3.095, P< 0.05), in ARC (t=2.519, P< 0.05) and in TRC (t= 2.275, P<0.05.) in between Brahmin and Muslim males. Interestingly, such significant variations cannot be seen in between the two female groups.

DISCUSSION

Dermatoglyphic traits are inherited and show slow changes in the frequencies of digital patterns within a population due to genetic admixture of different ethnic groups. In the present study, whorl fingerprint patterns are most dominant in digit 1 among the Brahmans whereas in digit IV for the Muslims, irrespective of hands and sex. Loops are more prevalent in digit V, with an exception to digit III among the Muslim males. Arches commonly occur in digit II in both the populations. Loops (UL) are the most common finger print patterns in both Brahmins (57.95%) and Muslims (51.55%) which confirm the global distribution of whorl, loop and arch patterns. According to Fingerprint world -map global distribution of whorls, loops and arches, ulnar loops are the most frequent finger patterns around the world supported by 28 populations, out of 33. However, in only 5 populations, whorls are higher than loops, out of 33 populations, and also more among the Chinese and Malaysia. Further, in the perspective of Darwin's theory of Evolution, whorls are less present in humans than primates (Mensvoort, 2015).

The Whorl-Loop ratio in the Brahmins is in the ratio of 37:63 and that of Muslims was 44:56. The ratio of Whorl-Loop occurred in the proportion of 50:50 among the Mongoloid people (Chakravartti & Mukherjee, 1963). Among the Bishnupriyas of Assam (ibid.) and Khangabok, (Singh, 1991), such a higher occurrence of loops were recorded, which may suggest having similar origin with the present study population. Such a trend of having highest percentage of loops (65.41%) was also observed in the study (Sandeep *et al.,* 2017) among the population of Nanded district of Maharashtra. Thus, variations have been observed in between these Brahmin and Muslim communities of the present study. There is a significant difference in the digital patterns of whorls and arches between Brahmin and Muslim populations of Manipur, thus showing higher Dankmeijer's Index and Poll's Index in Brahmin population and showing higher Furuhata's Index in Muslim population. The Pattern Intensity Index (PII), which is a most dependable racial determinant (Newman, 1960) shows significant difference in between Brahmin and Muslim males. In Pattern Intensity Index, Furuhata's Index and Dankmeijer's Index,the Brahmin of Manipur exhibit similarity with the Brahmin of Maharashtra and Kumaon (Chaube, et al., 1991). The Muslims of Manipur shows close similarity with the Kashmir (Sen, 1968) and Sunni Muslim of Hoogly West Bengal (Haque & Alam, 1990) in respect of whorl, loop and Furuhata's Index. Statistically, significant differences have been shown in the comparisons of PII ($t=3.095$, $P< 0.05$), in ARC ($t=2.519$, $P< 0.05$) and in TRC ($t= 2.275$, $P<0.05$.) in between Brahmin and Muslim males. Interestingly, such significant variations cannot be seen in the female populations of the two groups.

Conclusion

It may be concluded that distribution of fingerprint patterns show variations in both sexes of Brahmins and Muslims, as such, significant differences have been indicated in the comparisons of whorl, loop and arch frequencies of the present study, statistically. Further significant variations have also revealed in the comparisons of mean values of Pattern Intensity Index (males), which is a most dependable racial determinant (Newman, 1960), and also in Absolute ridge count and Total ridge count, but not found in between the females of Brahmins and Muslims in the above three parameters. This suggest that homogeneity in the detail features of fingerprints still retained through the process of inheritance among the two female groups who have been descended from the same Meitei women ethnic stock of Manipur.

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