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Finger Dermatoglyphics of the Gadaba tribe of Bastar, Chhattisgarh

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ABSTRACT

Bilateral finger print of 200 unrelated individuals (100 males and 100 females) of Gadabas of Bastar in Chhattisgarh were collected. The analysis included qualitative and quantitative traits Present study indicates the higher incidence of loops followed by whorls and arches in either sex with nonsignificant sex differences. The gradational order of finger pattern types is observed as L>W>A in both sexes, where as whorl is found to be higher in males than the females. The symmetry pattern including whors, loops and arches is much higher than the asymmetry pattern in l oth sexes of Gadaba tribe. The left hand is more monomorphic than the right hand in males and a reverse trend can be seen in females. The values of P.I.I. and Furuhata's index is found to be higher in males than the females. The mean digital ridge counts in both hands were found to be greater in females than males. The mean TFRC and ATFRC values were also observed greater among females than the males. The comparison of Gadaba with other tribal populations indicates significant intertribal differences with Muria, Bhatra, Birhor, Gond, Binjhwar, Halba, Sabara and Binjhia tribal groups of India.

INTRODUCTION

The genetic analysis of dermatoglyphic characters help us in understanding the heredity aspect of traits characterised by the interaction of genes and environment. Cummins and Midlo, 1943 pointed out that dermatoglyphic is objectively heritable and the racial differences in dermalyphic traits are real. They also emphasized that the geometric variability of finger patterns has attracted the attention of anthropologists since frequencies of pattern types vary from one population to another. Holt, 1968 stated that absolute finger ridge counts may be biologically more meaningful than that of total finger ridge count. Ghosh and Nanda, 1975 were noticed that pattern intensity, index whorl-loop index and arch-whorl index are found to be greater in male than females.

The Gadaba is a minor tribal group comprises about 0.73% of total tribal population of Bastar.. They mainly earn their livelihood by cultivating crops like rice, kodon, kutaki,

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maize and other milletes beside these many Gadaba families engaged as labourer in agriculture, house-building and other works available in Jagdalpur town. They are divided into a number of exogamous clans named after plants and animals. Descent is reckoned in the male line and marriage between persons belonging to the same clan is prohibited, while cross-cousin marriage is socially permitted among them. The aim of the present paper is to investigate the dermatoglyphic features and to examine the degree of relationship with other tribal populations.

MATERIAL AND METHOD

The present study conducted among the Gadaba tribe of Bastar, Chhattisgarh. Bilateral finger prints of 200 unrelated Gadaba individuals (100 males; 100 females) were collected from tribal villages ; Jatem, Sergipal, Khutpadar and Tusel and analysed by following the methods given by Cummins and Midlo (1961). In present study finger patterns, monomorphic hands, finger indices and finger ridge counts are considered to report the Gadaba's features in respect of their finger dermatoglyphics.

RESULTS AND DISCUSSION

Finger pattern Types

The percentile distribution of finger pattern types among both the sexes of Gadabas is presented in Table 1. Whorls are observed most common pattern on digit-I, and IV among both sexes, while its bilateral distribution indicates the higher incident of whorl on the left hand than the right hand. However loops are noticed more frequent on right hand than the left hand in both sexes of Gadaba tribe. The three basic finger pattern types for fingers are observed as follow :

	Males	**Females**
W :	I > IV > II > V > III	I= IV > II > III > IV
L :	V > III > II > IV > I	V > III > II > IV > I
A :	II > I > III > IV > V	I > II > III > IV > V

It is evident from table that the loops are more common as compared to whorls and arches in either sex with non-significant sex difference. The incidence of whorls is relatively higher in males (41.10%) than females (38.80%), whereas loops are slightly more frequent in females (57.80%) than males (57.00%). The incidence of arches is relatively higher in females (3.40%) than males (1.90%). An overall, the gradational order of finger pattern types is observed as L > W > A in both sexes of Gadabas of Bastar.

Symmetry and Asymmetry

Table 2 indicates the percentile distribution of similarity on homologous digits of right and left hand in basic finger patterns. The incidence of a symmetry is higher in males (28.60%) than females (26.00%) while the incidence of symmetry including loop whorl and arch is much higher than asymmetry. The propation of loop symmetry is higher in females (44.60%) than males (42.80%). However the gradational order of pattern symmetry

is observed as L > W > A in both sexes of Gadaba of Bastar. The digit wise total pattern symmetry is found to higher on digit V (86.00%) in females and on digit III (77.00%) in males.

Monomorphic Hands

The percentile distribution of monomorphic hands among the Gadabas of Bastar is presented in Table 3. Table reveals that females are more monomorphic than males on right hand ; while males indicate higher incidence of monomorphic hand on right hand. However when both hands onsidered for ten finger for the same pattern the frequency of monomorphic hand is reduced and it is found to be higher in females (11.00%) than males (9.00%). The incidence of monomorphic hand indicates non-significant bilateral difference in male samples and significant bilateral difference in females at 5% level of probability, while no statistically significant difference has been observed in sex-comparison.

Pattern Intensity Index

The pattern intensity'index is shown in Table 4 along with standard devation. The pattern intensity index is the average number of triradi which depends on the incidence1 of finger patterns. It will be more if W > L > A. and it will be less when'incidence of patterns will be A>L>W. The pattern intensity Index is found to be higher in males (13.71) than females (13.58).

Furuhata's Index : It is the ratio of total whorls to total loops. Table 5 shows the higher value of this index in males (72.10%) than females (67.13%) among the Gadabas of Bastar.

Dankmeijer's Index : The ratio of total arches to total whorls is known as Dankmeijer index and indicates higher value in females (8.76%) than males (4.62%).

Finger Ridge Counts

Table 6 indicates the distribution of mean digital ridge counts among both the sexes of Gadaba tribe along with standard errors. The highest mean on digit II in either hand or sex of the population, while the mean value of digital ridge counts is found to be higher on right hand than left in both sexes. The mean digital ridge count is observed higher in females than males in both hands. Digit wise finger ridge counts are observed as follows:

Hand	Males	Females
R :	I > IV > III > V > II	I > IV > III > V > II
L :	I > IV > III > V > II	I > V > IV > III > II

The combined values of finger ridge counts are observed in the order of I > IV > III > V > II among both the sexes of Gadaba population. Finger ridge count on right hand is found to be higher in females (66.53 ±1.97) than males (66.04 ±2.04) and on left hand the value of total finger ridge count is also higher in females (66.36±2.03) than males (63.86±1.95). However an overall, sex differences is noticed statistically non-significant.

Total Finger Ridge Count (TFRC) and Absolute Finger Ridge Count (AFRC)

Table 7 indicates the distribution of mean total finger ridge count and absolute finger ridge count among the Gadaba of Bastar. The mean TFRC is found to be higher in females (131.52±2.97) than males (129.90±1.62). Similarly the mean ATFRC is also observed higher in females (179.85±7.78) than males (177.65±6.21). Sex differences for TFRC and ATFRC are observed statistically non-significant among Gadabas of Bastar.

Digit wise distribution of Summed Ridge Counts.

Table 8 indicates the distribution of digit wise summed ridge counts (for whorls both counts summed) among both the sexes of Gadabas of Bastar. The digit wise summed ridge counts of left hands show higher mean values than right hand on digit II, III and IV in females. The digit I indicates the highest mean values followed by digit IV in both sexes. The digit wise mean summed ridge counts are occurred in order of I > IV > II > V in both sexes of Gadaba tribes of Bastar.

Comparison with some tribal population

Total finger ridge count of the present samples is compared with some of the tribal population in order to examine the interrelationship between them. The mean TFRC value vary from 122.17 to 151.65 in male tribal population and 128.30 to 136.16 in female tribal population. The TFRC values of Gadaba tribe (129.90 - 131.52) are observed closer to tharu male, Bada Binjhwar females and Halba females-Intergroup variations are observed significant with Bada Binjhwar male and Halba males. (Table 9)

The percentile frequency of whorls ranges between 22.50-66.70% in male groups and between 24.70 to 51.90 in female groups of tribal population, while in present sample the proportion of whorls is observed 41.10% in males and 38.80% in females. The proportion of loops varies from 33.50 to 75.30% in males groups and from 42.70 to 67.40% in females group of tribal population, where as the proportion of loops in present sample is observed 57.00% in males and 57.88% in females. The frequency of arches varies from 0 to 7.00% in male groups and from 1.50 to 7.90% in female groups of tribal population, while present study reveals 1.90% arches in males and 3.40% in females (Table 9).

The present finding of whorl frequency in Gadaba tribe (M : 41.10% ; F : 38.80%) fall closer to Birhor, Sabara males, Khond males, Juang, Saora males, Lambodi males, where as on the basis of loop frequency Gadaba tribe (M : 57.00% ; F : 57.80%) indicate closer relation to Sabara males, Juang males, Lambadi males. The proportion of arches is relatively low among both the sexes of tribal populations. The incidence of arches among Gadaba tribe (M : 1.90% ; F : 3.40%) is observed similar to Bison Hornmaria males, Maria males, Halba males, Birhor males, Munda males, Sabara males, Gond males 2 ?

and Juang females. X test for intergroup variation indicates significant variation with Muria males, Bhatra males, Birhor males, Gond males and Sahara females (Table 9).

The mean values of pattern intensity index vary from 12.00 to 15.50 in male groups and from 11.70 to 14.80 in female groups in reported tribal population. In this context Gadaba (M: 13.71 ;F : 13.58) shows closer relation to Khond males, Juang and Lainbadi males (Table 9).

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Table - 1
Distribution of finger pattern types among both the sexes of Gadaba tribe of Bastar

Digit	Side	Gadaba Males			Gadaba Females		
		W	L	A	W	L	A
I	R	63.00	35.00	2.00	48.00	48.00	4.00
	L	58.00	39.00	3.00	54.00	39.00	7.00
	R+L	60.50	37.00	2.50	51.00	43.50	5.50
II	R	41.00	56.00	3.00	43.00	53.00	4.00
	L	35.00	59.00	6.00	46.00	50.00	4.00
	R+L	38.00	57.50	4.50	44.50	51.50	4.00
III	R.	20.00	79.00	1.00	17.00	81.00	2.00
	L	32.00	66.00	2.00	37.00	59.00	4.00
	R+L	26.00	72.50	1.50	27.00	70.00	3.00
IV	R	51.00	48.00	1.00	49.00	50.00	1.00
	L	58.00	41.00	1.00	53.00	43.00	4.00
	R+L	54.50	44.50	1.00	51.00	46.50	2.50
V	R	24.00	76.00	0.00	16.00	83.00	1.00
	L	29.00	71.00	0.00	25.00	72.00	3.08
	R+L	26.50	73.50	0.00	20.50	77.50	2.00
Total	R	39.80	58.80	1.40	34.60	63.00	2.40
	L	42.40	55.20	2.40	43.00	52.60	4.40
	R+L	41.10	57.00	1.90	38.80	57.80	3.40

Table - 2
Symmetry and asymmetry of finger pattern types among both the sexes of Gadaba tribe

Digit	Male (n=100)				Symmetry	Females (n=100)				Asymmetry
	W	L	A	Total		W	L	A	Total	
I	45.00	23.00	1.00	69.00	31.00	42.00	30.00	2.00	74.00	26.00
II	25.00	39.00	1.00	65.00	35.00	31.00	34.00	1.00	66.00	34.00
III	15.00	61.00	1.00	77.00	23.00	15.00	57.00	2.00	74.00	26.00
IV	42.00	31.00	0.00	73.00	27.00	38.00	31.00	1.00	70.00	30.00
V	13.00	60.00	0.00	73.00	27.00	14.00	71.00	1.00	86.00	14.00
Total	28.00	42.80	0.60	71.40	28.60	28.00	44.60	1.40	74.00	26.00

Sex difference = Non-significant

Table - 3
Distribution of monomorphic hands among both the sexes of Gadaba tribe

Hand	Male (n=100)				Female (n=100)			
	W	L	A	Total	W	L	A	Total
R	8.00	18.00	0.00	26.00	5.00	25.00	0.00	30.00
L	14.00	17.00	0.00	31.00	11.00	16.00	1.00	28.00
(R+L)* combined	3.00	6.00	0.00	9.00	2.00	9.00	0.00	11.00

**10 fingers counts to gether : Sex-difference = Non significant*

Table - 4
Mean pattern intensity index among both the sexes of Gadaba tribe

	Male (n=100)			Female (n=100)		
	Mean+S.E.	S.D+S.E.	C.V.	Mean+S.E.	S.D+S.E.	C.V.
P.I.I.	13.71+0.34	3.35±0.24	24.43	13.58±0.36	3.60+0.26	26.51

Sex difference = Non-significant

Table - 5
Distribution of indices among both the sexes of Gadaba tribe

Male (n=100)		Female (n=100)	
Furuhata's Index	Dankmeijer's Index	Furuhata's Index	Dankmeijer's Index
72.10	4.62	67.13	8.76

Table - 6
Mean digital ridge count among both the sexes of Gadaba tribe

Digit	Male (n=100)		Female (n=100)	
	Mean±S.E.	S.D+S.E.	Mean±S.E.	S.D+S.E.
Ri	16.37±0.52	5.20±0.37	15.71+0.64	6.40+0.45
R2	11.35±0.45	4.46±0.32	11.96+0.49	4.94+0.35
R3	12.41+0.38	3.73±0.27	12.43+0.48	4.84+0.34
R4	13.72+0.49	4.8?±0.35	14.31+0.48	4.80+0.34
Rs	12.19±0.38	3.77±0.27	12.12+0.45	4.50+0.32
Total R	66.04+2.04	20.37±1.44	66.53+1.97	19.78+1.39
Li	15.09+0.54	5.3310.38	14.50+0.63	6.28+0.44
L2	11.10+0.49	4.89±0.35	11.68+0.51	5.11+0.36
L3	12.36±0.42	4.19+0.29	13.04+0.51	5.14+0.36
U	13.6710.46	4.53+0.32	13.56+0.56	5.63+0.40
L5**	11.64+0.35	3.46+0.25	13.58+0.57	5.74+0.41
Total L	63,86+1.95	19.48+1.38	66.36+2.05	20.05+1.41

*** Significant sex difference at 2% level of probability*

Table - 7
Mean TFRC and ATFRC among both sexes of Gadaba tribe

Ridge Counts	Male (n=100)		Female (n=100)		Sex Difference
	Mean±S.E.	S.D±S.E.'	Mean±S.E.	S.D±S.E.	
TFRC	129.90±1.62	16.18±1. l4	131.52+2.97	29.75+2.10	0.49
ATFRC	177.65+6.21	62.13+4.39	179.85+7.78	77.89+5.51	0.22

Table - 8
Digit wise summed mean ridge count among both the sexes of Gadaba tribe

Digit	Hand	Male (n=100)		Female (n=100)	
		Mean±S.E.	S.D.±S.E.	Mean+S.E.	S.D.±S.E.
I	R	24.73+1.09	10.98±0.78	23.17±1.25	12.42±0.88
	L	22.91 + 1.14	11.43+0.80	22.48±1.27	12.68+0.89
	R+L	23.78±1.02	10.19+0.72	22.67±1.19	11.95+0.85
II	R	15.49±0.85	8.50+0.60	16.85±0.98	9.73+0.69
	L	14.82±0.88	8.72±0.62	17.20±1.04	10.38+0.74
	R+L	15.15±0.77	7.70+0.55	17.09+0.93	9.27+0.66
III	R	14.82+0.76	7.60+0.54	14.53+0.79	7.83+0.56
	L	16.20+0.89	8.95±0.64	17.60+1.00	10.03±1.41
	R+L	15.50±0.76	7.56±0.54	15.80±0.84	8.37±0.59
IV	R	19.81+0.99	9.88+0.69	20.21+0.95	9.46+0.67
	L	20.60+0.98	9.87±0.69	20.30±1.13	11.24+0.79
	R+L	20.20±0.89	8.96±0.64	20.26+0.93	9.74+0.69
V	R	14.44+0.70	7.05±0.49	13.5710.68	6.79+0.48
	L	14.22+0.64	6.36+0.45	14.27+0.77	7.70±0.55
	R+L	14.33+0.59	5.96±0.43	13.92+0.68	6.74+0.48
Total	R	17.79±0.66	6.57±0.47	17.59±0.75	7.48±0.53
	L	17.72+0.73	7.28±0.52	18.36+0.87	8.69+0.62
	R+L	17.76+0.65	6.50+0.46	18.04+0.79	7.83+0.56

Table - 9

Comparison of Gadaba tribe with various tribal population with respect to finger patterns, PII and TFRC

S.No.	Population	Sex	Source	Pattern Type			P.I.I.	TFRC	Intergroup Variation	
				W	L	A			Finger pattern type	TFRC
1.	Bison Horn Maria	M	Ghosh, 1977	46.10	52.20	1.70	-	-	n.s.	-
2.	Maria	M	Ghosh, 1977	52.80	45.90	1.30	-	-	n.s.	-
3.	Maria	F	Ghosh, 1977	47.90	50.60	1.50	-	-	n.s.	-
4.	Halba	M	Sharma, 1970	47.20	49.40	1.60	14.30	-	n.s.	-
5.	Muria**	M	Sharma, 1970	52.50	38.00	7.00	14.30	-	**	-
6.	Bhatra*	M	Sharma, 1970	54.50	45.50	0.00	-	-	*	-
7.	Birhor*	M	Gupta, 1970	57.30	42.70	-	15.50	-	*	-
8.	Birhor	F	Gupta, 1970	44.80	53.50	1.70	14.30	-	n.s.	-
9.	Munda	M	Tyagi, 1967	47.80	50.00	2.20	14.40	-	n.s.	-
10.	Munda	F	Tyagi, 1967	51.90	42.70	5.40	14.40	-	n.s.	-
11.	Binjhwar	M	Sen, 1975	50.00	46.15	3.85	14.61	151.65+1.95	n.s.	***
12.	Binjhwar	F	Sen, 1975	45.62	49.12	5.26	14.03	128.30+3.88	n.s.	-
13.	Sahara	M	Sarkar, 1957	42.40	55.90	1.70	14.10	-	n.s.	-
14.	Sabara*	F	Sarkar, 1957	24.70	67.40	7.90	11.70	-	*	-
15.	Khond	M	Sarkar, 1957	42.00	52.90	5.10	13.70	-	n.s.	-
16.	Santhal	M	Sarkar, 1957	45.50	54.50	-	14.50	-	n.s.	-
17.	Gond**	M	Sarkar, 1957	22.50	75.30	2.20	12.00	-	**	-
18.	Juang	M	Sarkar, 1957	42.00	56.60	1.40	-	-	n.s.	-
19.	Juang	F	Sarkar, 1957	38.80	57.70	3.50	13.50	-	n.s.	-
20.	Saora	M	Tripathi, 1965	42.50	54.00	3.70	14.90	-	n.s.	-
21.	Lamhadi	M	Gupta, 1961	38.30	56.20	5.50	13.30	-	n.s.	-
22.	Lamhadi	F	Gupta, 1961	30.10	62.30	7.60	12.20	-	n.s.	-
23.	Koya Dora	M	Rao, 1968	46.90	48.80	4.30	15.20	-	n.s.	-
24.	Koya Dora	F	Rao, 1968	49.90	48.30	1.00	14.80	-	n.s.	-
25.	Bhil	M	Malhotra et.al. 1978	-	-	-	-	134.57+5.15	-	n.s.
26.	Katkari	M	Malhotra et.al. 1978	-	-	-	-	122.17+4.65	-	n.s.
27.	Thara	M	Singh, 1961	-	-	-	-	130.61+2.30	-	n.s.
28.	Rana Tharu	M	Srivastava, 1963	-	-	-	-	135.23+3.75	-	n.s.
29.	Halba	M	Verma, 1988	-	-	-	-	143.23+3.75	-	***
30.	Halba	F	Verma, 1988	-	-	-	-	136.16+2.87	-	n.s.
31.	Binjhia	M	Sen, 1975	-	-	-	-	135.61+3.33	-	n.s.
32.	Binjhia	F	Sen, 1975	-	-	-	-	120.30+3.96	-	*

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