

## **FINGER AND PALMAR DERMATOGLYPHICS OF GOND AND LODHI FEMALES OF WESTERN MANDLA**

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### **ABSTRACT**

The present study has been conducted on 59 Gond and 33 Lodhi females of Western Mandla. Data on finger and palm prints of Gond females were collected from residential schools at Maharajpur and Mandla. Data on Lodhi females were collected from the village Bingia. The standard methods described in Cummins and Midlo (1961) were followed for obtaining and identification of finger and palm prints. The results on finger patterns of Gond and Lodhi females show that out of various distributions of patterns on digits (hands combined) ulnar loops predominate in both the groups i.e. 55.95% among Gond and 67.57% among Lodhi females followed by whorls, arches and radial loops. Among whorls, single spiral whorls are more common in both the groups followed by concentric whorls and double spiral whorls in Gond females and double spiral whorls follow concentric whorls in Lodhi females. Lateral pocket loops are absent in both the groups. Of all the indices, the value of Furuhat's index is maximum in Gond as well as in Lodhi females. This value is greater in Gonds than Lodhis because of greater proportions of whorls than loops. The value of Dankmeijer's index is minimum in both the groups but Lodhi females exhibit greater value (12.08) for this index than Gond females (8.08) thereby pointing towards comparatively greater number of arches and lesser number of whorls. It was observed that there were no significant bimanual differences for total ridge count on individual fingers, whereas, in inter -group differences all digits showed significant differences between them at 0.05% level. The most frequent main line formula among Gond females was 7.5.5-and among Lodhi females it was 11.9.7-. The main line D showed a greater tendency to terminate at position 7 (48.30%) in Gond and (34.84% ) in Lodhi females. Main line A terminated predominantly at position 3 (50.00%) in Gond females and at position 5' in Lodhi females (46.96%). The axial triradii appeared with highest frequency for both Gond(66.95%) and Lodhi females(74.24%) at position

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t. t values showed highly significant differences between Gond and Lodhi females with respect to a-b ridge count only. ( $p < 3.96^*$ ) Among Gond and Lodhi females true palmar patterns were more frequent in interdigital IV and III region followed by a decreasing trend in hypothenar, Thenar +I and II inter-digital area.

**Keyword:** Dermatoglyphics, Furuhat's index, Dankmeijer's index, Interdigital Ridge Count

## INTRODUCTION

Dermatoglyphics is a field which has drawn attention of physical anthropologists, forensic scientists, anatomists, geneticists and medical scientists because of their uniqueness and use in personal identification; as a marker in population studies as well as due to their association with genetically determined diseases. Finger prints are being extensively used in establishing biometric identity of individuals at work places, immigration centers and in solving legal matters. Dermatoglyphic traits are formed during embryonic development and remain unaltered all through the postnatal period until death (Cummins and Midlo, 1961). These patterns are heritable. Genetic analysis of various studies has shown that different genes are responsible for different finger and palmar traits. There is a general consensus that the inheritance of most dermatoglyphic features is polygenic or multifactorial with individual genes contributing a small additive effect (Holt, 1968; Penrose, 1969; Loesh, 1971; Weninger, 1976; Bhasin, 2007; Shahrudin *et al.*, 2009). Ecological and environmental factors probably have no effect on these traits (Hienaux and Froment, 1976). Therefore, these traits are considered more suitable to establish relationships between populations. Several studies have demonstrated the association of dermatoglyphics with congenital malformations and diseases. (Penrose, 1969; Schaumann and Alter, 1976; Loesh, 1983; Talwar *et al.*, 1994; Kaur and Batra, 2013; Wijerathne *et al.*, 2016). Numerous studies have been conducted on various communities as well as tribal populations of India to study the population variations in qualitative and quantitative dermatoglyphic traits (Biswas, 1957; Bansal, 1965; Sharma, 1966; Tiwari and Chattopadhyay, 1967; Chattopadhyay and Sharma, 1969; Sharma, 1970; Ghosh, 1978; Singh and Bhasin, 1979; Bhasin *et al.*, 1994; Bhasin and Walter, 2001; Kumbnani, 2007; Biswas, 2011; Kapoor and Badiye, 2015). Keeping in mind the importance of dermatoglyphic traits in anthropological investigations, an attempt has been made in the present study to analyze the variations observed in finger and palmar dermatoglyphics of Gond and Lodhi females of Western Mandla.

## MATERIAL AND METHODS

The present study has been conducted on 59 Gond and 33 Lodhi females of Western Mandla. Data on finger and palm prints of Gond females were collected from residential schools at Maharajpur and Mandla. Data on Lodhi females were collected from the village Bingia. The standard method described in

Cummins and Midlo (1961) were followed for obtaining and identification of finger and palm prints. The inter-group differences in quantitative traits were analysed through t-test. A p-value of <0.5 was considered as significant.

## RESULTS

### Finger Patterns

The percentage distribution of patterns on digits of Gond and Lodhi females (hands combined) are presented in Table 1. The most predominant pattern of occurrence among Gond and Lodhi females is Ulnar loops (55.59%, 67.57%) followed by whorls (39.82%, 27.59%). Among Gond females, arches (3.21%) occur more frequently than radial loops (1.35%) and among Lodhi females also arches (3.53%) occur more frequently as compared to radial loops (1.51%). Thus, in both Gond and Lodhi females ulnar loops are the most frequent pattern types, whereas, radial loops occur with minimum frequency. It is clear from the table that in Gond females ulnar loops show highest frequency on digit V (69.49%) but among Lodhis it is on digit III (77.27%). Whorls and Radial loops in both groups show higher percentage on digit IV and II respectively, Arches in Gonds occur more frequently on digit II and in Lodhis on digit III.

**Table 1: Percentage Distribution of pattern on digits of Gond and Lodhi Females (hands combined)**

Patterns Types	Digit I	Digit II	Digit III	Digit IV	Digit V	All Digits
<b>GOND FEMALES (N=59)</b>						
Whorls	45.76	42.37	26.27	55.93	28.81	39.82
Ulnar Loops	50.00	44.91	68.64	44.91	69.49	55.59
Radial Loops	0.84	4.23	0.84	0.84	0.00	1.35
Arches	1.69	8.47	5.08	0.84	0.00	3.21
Accidentals	0.00	0.00	0.00	0.00	0.00	0.00
<b>LODHI FEMALES (N=33)</b>						
Whorls	30.30	33.33	12.12	43.93	21.21	27.59
Ulnar Loops	68.15	57.57	77.27	53.03	53.03	67.57
Radial Loops	0.00	6.06	1.51	0.00	0.00	1.51
Arches	1.51	4.54	9.09	1.51	0.00	3.33
Accidentals	0.00	0.00	0.00	0.00	0.00	0.00

Table 2 represents the percentage distribution of the digital pattern of left and right hands of Gond and Lodhi females. It is observed from the table that in both females (Gond and Lodhi females), ulnar loops are higher in distribution followed by whorls, arches and radial loops. When we compare the digital pattern present on both left and right hand of Gonds as well as of the Lodhi females, left hand in either group showed higher percentage of distribution of patterns except for ulnar loops in Gond and lodh females which occur in greater frequency on the right hand. Ulnar loops are higher in percentage distribution in Lodhi females than Gond females.

**Table 2: Percentage Distribution of the digital patterns on left and right hands of Gond and Lodhi Females**

Pattern Types	Right Hand	Left Hand	Both Hand
GOND FEMALES (N=59)			
Whorls	36.94	42.71	39.82
Ulnar Loops	60.00	51.18	55.59
Radial Loops	0.67	2.03	1.35
Arches	2.37	4.06	3.22
Accidentals	0.00	0.00	0.00
LODHI FEMALES (N=33)			
Whorls	26.06	29.09	27.57
Ulnar Loops	70.90	64.24	67.27
Radial Loops	0.60	2.42	1.51
Arches	2.42	4.24	3.33
Accidentals	0.00	0.00	0.00

Table 3 represents percentage frequencies of Finger print types in both Gond and Lodhi females. It has been observed that the occurrence of L<sup>U</sup> (55.59%) is more in Gond females followed by W<sup>SS</sup> (24.91%), whorl concentric (3.05%) and double spiral whorls (1.69%) in all digits of both hands (R+L). Similarly Lodhi females showed maximum occurrence of ulnar loops (67.57%) followed by W<sup>SS</sup>, (15.45%), whorl double spiral (2.12%) and whorl concentric (0.30%). Lateral pocket loops and Accidentals were absent in both the groups. Central pocket loops and twin loops constituted 5.10% and 5.08% in Gonds and 4.54% and 5.15% in Lodhi females respectively. Percent frequencies of W<sup>SS</sup>, W<sup>C</sup> and A<sup>P</sup> are more in Gond females than Lodhi females, whereas, the percent frequencies of L<sup>U</sup>, TL, A<sup>T</sup>, and L<sup>R</sup> are more in Lodhi females than Gond females.

**Table 3: Percentage frequencies of Finger print types in both Gond and Lodhi females**

Digit	Side	Whorls			Composites			Loops			Arches	
		W <sup>c</sup>	W <sup>ss</sup>	W <sup>ds</sup>	LPL	TL	CPL	L <sup>u</sup>	L <sup>R</sup>	L <sup>Inv</sup>	A <sup>T</sup>	A <sup>P</sup>
Gond Females (N=53)												
1.	R	-	3.72	0.33	-	3.38	1.69	10.30	-	-	-	0.33
	L	-	4.70	0.67	-	3.38	0.67	9.83	0.33	-	-	0.33
	R+L	-	4.23	0.50	-	3.38	1.18	10.1	0.16	-	-	0.33
2.	R	0.67	8.47	0.33	-	1.01	0.67	7.11	0.67	0.33	0.33	0.33
	L	1.35	5.76	0.33	-	0.67	1.35	7.43	1.35	-	1.35	0.33
	R+L	1.01	7.11	0.33	-	0.84	1.01	7.28	1.01	0.16	0.84	0.33
3.	R	-	3.38	-	-	0.33	-	15.93	-	-	-	0.33
	L	0.87	4.06	1.01	-	-	0.67	11.3	0.33	-	0.67	1.01
	R+L	0.33	3.72	0.50	-	0.16	0.33	13.7	0.16	-	0.33	0.67
4.	R	0.67	9.83	0.33	-	-	-	8.47	0.33	-	-	-
	L	2.37	7.11	-	-	-	1.69	8.47	-	-	0.33	-
	R+L	1.51	8.47	0.16	-	-	0.84	8.47	0.16	-	0.16	-
5.	R	-	4.06	-	-	0.67	1.35	13.8	-	-	-	-

	L	0.33	2.03	-	-	0.67	-	14.5	-	-	-	-
	R+L	0.16	3.05	-	-	0.67	0.61	14.23	-	-	-	-
All digits	R	1.35	29.4	1.01	-	5.42	3.72	55.9	1.01	0.33	0.33	1.01
	L	4.74	23.7	2.03	-	4.47	4.40	51.8	2.03	-	2.31	1.69
	R+L	3.03	26.6	1.53	-	5.05	4.06	53.8	1.52	0.16	1.51	1.35
Lodhi Females (N=33)												
1.	R	0.60	0.60	0.60	-	4.24	-	13.95	-	-	-	-
	L	-	1.81	-	-	3.30	1.21	13.33	-	-	-	0.60
	R+L	0.30	1.21	0.30	-	3.63	0.60	13.63	-	-	-	0.30
2.	R	-	3.63	0.60	-	1.81	1.21	10.9	0.60	-	1.21	-
	L	-	4.84	1.21	-	-	-	11.5	1.81	-	-	0.60
	R+L	-	4.24	0.90	-	0.90	0.60	11.2	1.21	-	0.60	0.30
3.	R	-	0.60	-	-	-	-	18.1	-	-	1.21	-
	L	-	2.92	0.60	-	0.60	0.60	12.7	0.60	-	2.42	-
	R+L	-	1.51	0.30	-	0.30	0.30	15.45	0.30	-	1.81	-
4.	R	-	7.27	-	-	-	1.21	11.5	-	-	-	-
	L	-	6.06	1.21	-	-	1.81	10.3	-	-	0.60	-
	R+L	-	6.64	0.60	-	-	1.51	10.9	-	-	0.30	-
5.	R	-	1.81	-	-	0.60	0.66	16.96	-	-	-	-
	L	-	1.81	-	-	-	1.81	16.36	-	-	-	-
	R+L	-	1.81	-	-	0.30	1.21	16.66	-	-	-	-
All digits	R	0.60	13.93	1.21	-	6.66	3.03	71.45	0.60	-	2.42	-
	L	-	16.96	3.30	-	3.63	5.45	64.20	2.42	-	3.30	1.21
	R+L	0.30	15.43	2.12	-	5.15	4.24	64.87	1.57	-	2.72	0.60

Distribution of values for various dermatoglyphic indices has been presented in table 4. It is clear from the table that Gond and Lodhi females show considerably higher values for Furuahata's index (G 69.94; L,39.91). The value for Pattern Intensity index (G 13.66; L 12.42) is higher than the value for Dankmeijer's index(G 8.08; L 12.08) in both the groups. However, the values of main line index for Gonds was 7.55 and was higher than them for Lodhis (7.92).

**Table 4: Distribution of value for the various Indices on fingers in Gond and Lodhi Females**

Indices	Gond Females	Lodhi Females
<b>Dankmeijer's Index</b>	8.08	12.08
<b>Furuhata Index</b>	69.94	39.91
<b>Pattern Intensity Index</b>	13.66	12.92
<b>Main Line index</b>	7.55	7.92

Mean and standard deviations of digital ridge count on individual fingers of both Gond and Lodhi females are represented in Table 5. The highest mean value of ridge counts were observed in digit I and digit IV of both left and right hands in both Gond and Lodhi females. The lowest mean values were recorded in digit II in both hands in both females. Bilateral comparison showed that the mean values of ridge counts were higher in all digits for right hand except for digit II in Gond females. Digit I and V showed higher mean values in right

hand, digit II and IV in left hand and digit III showed similar mean values in both hands in Lodhi females.

**Table 5: Mean, Standard Deviation of the ridge count on individual fingers of both Gond and Lodhi Females**

Digit	Right	left	R+L
GOND FEMALES (N=59)			
I	15.18±5.34	14.32±5.67	14.75±5.50
II	10.86±5.86	11.30±6.16	11.08±6.0
III	11.82±4.64	11.57±5.83	11.69±5.23
IV	14.11±4.79	13.52±5.70	13.87±5.24
V	12.89±3.84	11.69±4.34	12.28±4.09
LODHI FEMALES (N=33)			
I	11.51±3.32	10.57±4.00	11.04±3.66
II	8.66±3.78	8.93±3.72	8.79±3.75
III	9.66±3.98	9.66±5.32	9.66±4.65
IV	11.06±4.17	11.21±4.55	11.22±4.36
V	10.78±2.45	10.42±3.00	10.60±2.72

Table 6 showed t-values for total ridge count on individual fingers for both bimanual and intergroup differences. It was observed that there were no significant bimanual differences, whereas, in inter -group differences all digits showed significant differences between them at 0.05 % level.

**Table 6: t-values for total ridge count on individuals fingers (bimanual and inter group differences)**

Sr. No	Differences	Digit	t value
Bimanual differences			
1.	Gond Females (N=59)	I	0.86
		II	-0.40
		III	0.26
		IV	0.64
		V	1.62
2.	Lodhi Females (N=33)	I	1.03
		II	-0.29
		III	0.00
		IV	-0.14
		V	0.50
Inter group differences			
		I	3.74*
		II	2.14*
		III	1.99*
		IV	2.56*
		V	2.30*

\* significant at 0.05% level

### Palmar Patterns

Table 7 showed the distribution of principal main line formulae in both Gond and Lodhi females. In Gond females, main line formula 7-5-5 showed a higher distribution frequency (52.30 %) than the other two formulae i.e. 9-7-5 (26.15%) and 11-9-7 (21.53%). In Lodhi females, 11-9-7 is the most frequently occurring formula (35.00%) followed by 7-5-5 (32.50%) and 9-7-5 (30.00%), respectively. It is apparent from the table that frequencies of main line formulae 11-9-7 and 9-7-5 are higher in the right palms of both the groups, whereas, 7-5-5 type is most frequent in their left palm.

**Table 7: Distribution of principal main line formulae in Gond and Lodhi Females**

Main Line Formulae	Gond Females (N=59)			Lodhi Females (N=33)		
	R (%)	L (%)	R+L (%)	R (%)	L (%)	R+L (%)
11-9-7.	11 (32.35)	3 (9.67)	14 (21.53)	8 (44.44)	6 (27.27)	14 (35.00)
9-7-5.	10 (29.41)	7 (22.58)	17 (26.15)	9 (50.00)	3 (13.63)	12 (30.00)
7-5-5.	8 (23.52)	13 (41.93)	21 (52.30)	4 (22.22)	9 (40.90)	13 (32.50)

Table 8 showed the percent frequencies of termination of palmar main lines D and A in both Gond and Lodhi females. The main line D showed a greater tendency to terminate at position 7 (48.30%) in Gond and (34.84%) in Lodhi females. Among Gond females Main line D terminated at position 11 with frequency of 28.81% and in position 9 with 22.03%. The incidence of modal type D at position 9 is 31.81 % among the Lodhi females. The termination of main line A was also recorded among both the females (Gond and Lodhi females). The highest percentage of termination (55.93 %) was observed at position 3 for Gond females and at position 5 for Lodhi females (51.51%). In Gond females, main line A terminated at position 5 with frequency of 43.22% and at position 1 with 0.84%. Lodhi females showed its next higher frequency at position 3 (37.87%) and lowest frequency of termination at position 1 (10.6%).

**Table 8: Percent frequencies of three modal types (palmar main lines D and A) in both Gond and Lodhi Females**

Main Line	Position	Gond Females (N=59)			Lodhi Females (N=33)		
		R %	L %	R+L %	R %	L %	R+L %
D	11	35.59	22.03	28.81	33.33	33.33	33.33
	9	22.03	22.03	22.03	39.39	21.21	31.81
	7	42.37	54.23	48.30	24.24	45.45	34.84
A	5	55.93	30.50	43.22	63.63	39.39	51.51
	3	44.06	67.79	55.93	36.36	39.39	37.87
	1	0.00	1.69	0.84	0.00	21.21	10.60

Table 9 showed the position of axial triradii and their occurrence in different combinations among both Gond and Lodhi females. The axial triradii appeared with highest frequency for both Gond (66.95%) and Lodhi females (74.24%) at position t. The order of preponderance of axial triradii in Gond females was t>t'>tt'>t''>t''' showing percentage of 66.95%, 20.33%, 5.93%, 5.04% and 1.69%,

respectively. Lodhi females recorded the second highest frequency of appearance of axial triradii at position t' (22.73%). The percentage of presence of axial triradii at position t'' and tt' are equal (1.52 %) and 0 % at position tt''.

**Table 9: Position of Axial Triradii in Gond and Lodhi Females**

Position	Gond Females (N=59)			Lodhi Females (N=33)		
	R (%)	L (%)	R+L (%)	R (%)	L (%)	R+L (%)
t	67.79	66.10	66.95	78.78	69.69	74.24
t'	20.33	20.33	20.33	18.18	27.27	22.73
t''	.3.38	06.77	5.075	03.03	-	1.52
tt'	05.08	06.77	5.93	-	03.03	1.52
tt''	03.38	-	1.69	-	-	0

Mean and standard deviations for inter -digital ridge counts and atd angle are shown in Table 10. In both Gond and Lodhi females, the highest mean values were recorded for a-b ridge count followed by c-d and b-c ridge counts. When we compare the ridge count of right hand with left hand in both females (Gond and Lodhi), left hand showed highest mean values of a-b, b-c and c-d than right hand. It was also observed that when we compare the mean values of left hand of Gond females with left hand of Lodhi females and same with the right hand of both females. Gond females showed higher values of mean of ridge count in both right and left hands than Lodhi females. However, t-values showed highly significant differences between Gond and Lodhi females with respect to a-b ridge count only (3.96\*).

**Table 10: Inter-digital ridge count and atd angle among Gond and Lodhi Females**

Variable	Gond Females (N=59)				Lodhi Females (N=33)			
	Right Hand		Left Hand		Right Hand		Left Hand	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Interdigital ridge counts								
a-b	36.67	5.38	37.26	5.46	31.24	6.41	33.09	7.55
b-c	23.84	9.43	23.13	9.73	20.57	8.73	21.42	6.62
c-d	30.93	13.38	32.22	13.20	26.42	9.91	27.45	8.69
atd angle	44.45°	5.23	44.89°	8.50	43.27°	5.69	44.88°	6.71

The mean values of atd angle showed a slight higher value in left hand than right hand among females of both the groups. Lodhi females registered a mean <atd angle of 44.88° in left hand and 43.27° in right hand. Gond females showed a higher value of atd angle (R 44.45°; L 44.89°) than Lodhi females in both hands.

Percent distribution of true and not true patterns in various palmar dermatoglyphic areas are represented in table 11. It is clear from the table that both Gond and Lodhi females showed more not true patterns in distribution than true patterns. Distribution of Not true patterns in both combined hands in Gond females were highest in area II (94.06%) followed by Thenar +I (92.37%), hypothenar (78.80%), IV (72.80%) and III (55.08%) interdigital area, whereas true patterns showed the distribution more in area III (44.91%) followed by IV (27.11%), hypothenar (20.33 %), thenar+I (7.61%) and in interdigital area II

showing the percent distribution of 5.93 %. Among Lodhi females, percent distribution of not true patterns was more in Thenar+I and II (93.93 %) followed by Hypothenar (77.27%) interdigital area III (63.63 %) and area IV (36.36 %) and true patterns showed more distribution in dermatoglyphic area IV (63.63 %) followed by III (36.36%), Hypothenar (22.72%) Thenar + I and II (6.06%). When we compare the distribution of true and not true patterns in both Gond and Lodhi females, it has been observed that Lodhi females showed more distribution of true patterns in areas Hypothenar, II and IV and Gond females showed more distribution in Thenar+I and III and vice versa in case of not true patterns where Lodhi females showed more in areas Thenar+I and III and Gond females in Hypothenar, II and IV areas.

**Table 11: Percent distribution of true patterns including vestiges and not true patterns in various Palmar Dermatoglyphic areas**

GROUP	Hypothenar			Thenar+I			II			III			IV		
GOND FEMALEES															
	R	L	R+L	R	L	R+L	R	L	R+L	R	L	R+L	R	L	R+L
True Patterns	23.72	16.94	20.33	6.76	8.46	7.61	3.38	8.47	5.93	47.45	42.37	44.91	28.81	25.42	27.11
Not True Patterns	76.26	81.34	78.80	93.22	91.52	92.37	96.6	91.5	94.06	52.54	57.62	55.08	71.18	74.5	72.80
LODHI FEMALEES															
True Patterns	21.21	24.24	22.72	9.09	3.03	6.06	6.06	6.06	6.06	36.36	36.36	36.36	66.66	60.60	63.63
Not True Patterns	78.76	75.75	77.27	90.90	96.96	93.93	93.93	93.93	93.93	63.63	63.63	63.63	33.33	39.39	36.36

### DISCUSSION

It emerges from the results on finger patterns of Gond and Lodhi females that out of various distributions of patterns on digits (hands combined) ulnar loops predominate in both the groups i.e. 55.95% among Gond and 67.57% among Lodhi females followed by whorls, arches and radial loops. According to Bhasin (2007) in general Indian populations show low frequency of whorls varying from 22.50 to 66.70 as compared to loops ranging from 33.00 to 75.30 and arches exhibit an average frequency of 3.08. The results of the present study also agree with this general finding as well as other similar studies (Reddy,1975; Bhardwaja *et al.*, 2004; Gutierrez *et al.*, 2012; Kapoor and Badiye, 2015). Of all the indices, the value of Furuhat's index is maximum in Gond as well as in Lodhi females. This value is greater in Gonds than Lodhis because of greater proportions of whorls in them than loops. The value of Dankmeijer's index is minimum in both the groups but Lodhi females exhibit greater value (12.08) for this index than Gond females (8.08) thereby, pointing towards greater number of arches and lesser number of whorls in them Similar findings have been reported by Biswas (2011) among Dhimals of West Bengal.

Table 12 exhibits comparative data on the pattern types and derived indices of subjects of present study and various tribal populations. Frequency of whorls in Gond females is 39.82% and in Lodhi females it is 27.59%. These values of Gond females are closer to Salem-Kollimalaialis of Tamil Nadu (40.2) while Lodhi females have lowest values. The frequency of loops among Gonds (56.94%) matches that of Oraons (57.3%). In Lodhi females frequency of loops is 67.57% which is closer to Lodhas (61.88%). The percentage frequency of arches in

Gond females is 3.22 and in Lodhi females is 3.32 which brings them closer to Toda and Badga females of Nilgiri hills. The range of Dankmeijer's index is from 1.8 till 16.6. Nilgiri hills-Paniya females register the minimum value and Oraons exhibit the maximum value. The values of the present study for this index lie within this range. The value of Furuhashi's index of Gond females (69.94) matches that of Oraons (63.8) while Lodhi females have the lowest value for this index. Pattern Intensity index reveals similar range as that of other populations.

**Table 12: Comparison of Finger Dermatoglyphics and derived indices of Gond and Lodhi females with various tribal populations**

Area/Population	Sex	N	Pattern frequency (%)					Indices	References
			Whorls	Loops	Arches	A/W	W/L		
Oraons	F	117	36.6	57.3	6.1	16.6	63.8	13.05	Verma, B.B., 1952
Toda	F	100	44.60	42.40	3.00	6.72	85.11	14.16	Chakarvarti, M.R., 1960
Kota	F	124	42.90	55.00	2.10	4.80	78.11	14.08	Chakarvarti, M.R., 1960
Santals	F	62	52.51	45.83	1.61	15.09	114.45	3.07	Chakarvarti, M.R. 1960
Lodhas	F	48	36.61	61.88	1.46	3.98	59.27	13.52	Ghosh, A.K. and D.K. Nanda., 1975
Tamil Nadu Salem- Kollimalaialis	F	27	40.2	54.1	5.9	14.7	74.3	13.4	Sarma, A.V.N., 1962
Nilgiri Hills Paniya	F	112	53.6	45.4	1.0	1.8	118.1	15.3	Sarma, A.V.N., 1962
Nilgiri Hills Irula	F	112	45.0	52.5	2.5	5.6	85.7	14.2	Chakarvarti, M.R. D.P. Mukherjee., (1963).
Nilgiri Hills Badaga	F	156	43.0	52.4	3.0	4.2	78.6	14.1	Chakarvarti, M.R. D.P. Mukherjee, (1963).
Bhil	F	24	-	-	-	-	-	12.6	Geipel, 1961
Munda	F	6	-	-	-	-	-	14.2	Geipel, 1961
Korku	F	25	-	-	-	-	-	15.2	Geipel, 1961
Kharia	F	134	-	-	-	-	-	15.2	Geipel, 1961
Kisan	F	10	-	-	-	-	-	16.3	Geipel, 1961
Pooled	F	112	-	-	-	-	-	14.5	Geipel, 1961
Lambadi	F	54	-	-	-	-	-	13.28	Geipel, 1961
Gonds	F	59	39.82	56.94	3.22	8.08	69.94	13.66	Present study
Lodhis	F	33	27.59	67.57	3.32	12.08	39.91	12.42	Present study

Mean ridge count is maximum on I<sup>st</sup> digit on the right hands of both the groups. The t values for ridge counts on individual fingers did not exhibit significant differences in both the hands but inter-group differences were significant for ridge counts on all the digits at 0.05% level.

Table 13 presents mean ridge count on individual digits of Raj Gonds, Pradhans, Kolams from Yeotmal district of Maharashtra and Gonds and Lodhis of Western Mandla. It is apparent from the table that irrespective of population group, digit I and IV are characterized to have highest count followed by digit V and III. The present study also reveals similar findings.

**Table 13: Finger dermatoglyphics (Digital) (R+L) distribution of mean finger ridge count of Raj Gond, Pradhan, Kolam, Gonds and Lodhis**

Sample	Sex	Digit I	Digit II	Digit III	Digit IV	Digit V	Reference
Raj Gond	F	15.9	11.1	12.7	15.5	12.9	Ghosh, G.C., 1978
Pradhan	F	15.4	11.8	12.4	15.2	12.9	Ghosh, G.C., 1978
Kolam	F	15.2	11.9	13.1	15.4	12.5	Ghosh, G.C., 1978
Gonds	F	14.75	11.08	11.69	13.87	12.28	Present Study
Lodhis	F	11.04	8.79	9.66	11.33	10.6	Present Study

Table 14 shows the distribution of percentage frequencies of Principle main line formulae in some tribal populations of India. It is clear from the table that among various populations 11.9.7 is the most common formula and the frequency of 9.7.5 is the lowest. The typical main line formulae among the Indian tribals according to Singh and Bhasin (1979) is 11.9.7.-, 7.5.5.- and 9.7.5.- and among different castes it is 11.9.7, 9.7.5.- and 7.5.5.-, respectively. In the present study 7.5.5.- is the most frequent (52.30%) and 11.9.7 (21.53%) is the least frequent formula among Gond females and Lodhi females follow the typical tribal formula i.e. 11.9.7 (35.00%) the most frequent and 9.7.5 (30.00%) the least frequent formula. The value of main line index (both hands) in Lodhis is 7.92 and among Gonds it is 7.55. The difference in the values is 0.37. Biswas (2011) also found 7.5.5- to be the more frequent formulae (52.94%) with 7.38 as main line index and  $42.90^\circ$  as the  $\angle$  among Dhimals of North Bengal. Gonds of the present study exhibit similar findings.

**Table 14: Palmar dermatoglyphics (Percentage distribution of principle main line formulae in some tribal populations of India)**

Area/ Population	Sex	N	Palmar Main Line Formulae			Reference
			11.9.7.-	9.7.5.-	7.5.5.-	
Nilgiri Hills Paniya	F	112	37.9	13.4	25.9	Chakravartti, M.R. and D.P. Mukherjee., 1963
Nilgiri Hills Toda	F	110	57.3	1.8	1.8	Chakravartti, M.R. and D.P. Mukherjee., 1963
Nilgiri Hills Irula	F	112	34.8	17.0	25.9	Chakravartti, M.R. and D.P. Mukherjee., 1963
Lodha	F	48	22.00	7.3	13.4	Ghosh, A.K. et al., 1973
Santhals	F	61	25.6	14.1	31.4	Chakravartti, M.R. and D.P. Mukherjee., 1963
Gonds	F	59	21.53	26.15	32.30	Present Study
Lodhis	F	33	35.00	30.00	32.5	Present Study

Termination of main line D is more frequent at position 7 in both the groups i.e. 55.93% in Gond females and 45.45% in Lodhi females. Main line A terminates predominantly at position 3 (50.00%) in Gond females and at position 5' in Lodhi females (46.96%). Position t of axial triradius is predominant in both the Gond and Lodhi females i.e. 67.79% and 78.78% respectively. It is followed by axial triradius t' position in both the groups. The combination t'' and tt' occur in Gond females with very low percentage and t't'' is absent. Among Lodhi females t'' and t't'' combinations are altogether absent.

Studies in Indian populations by Bhasin (2007) have reported palmar patterns to be most frequent in interdigital IV and interdigital III regions along with a decreasing frequency from hypothenar to thenar + I and interdigital II region. Present study also reveal similar findings Earlier studies have proved that distribution of inter digital pattern follows a multiallelic major mode of inheritance Cheng *et al.* (2009).

Mean of inter-digital count (a-b) is maximum in both the groups. t values do not reveal any significant bimanual differences for inter-digital ridge count but inter-group differences are statistically significant for a-b, ridge count at 0.05% level. Reddy *et al.* (2004) stated that inter-digital ridge counts are useful to clearly portray population affinities based on broad geographic affiliations of the groups. Within geographic or linguistic regions, these variations depict the ethnic social affinities of the populations.

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