

Asymmetry and Correlations of Palmar Ridge Counts

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ABSTRACT Bilateral ridge count asymmetry and correlations among three palmar configurational areas, viz. a-b, b-c and c-d in Manne Dora tribe from Andhra Pradesh are investigated. The highest mean directional asymmetry (MDA) for ridge count is noticed in c-d among men and a-b among women. The interdigital area c-d registers the highest mean absolute asymmetry (MAA). The correlation coefficients between ridge counts of various configurational areas indicate that correlations between homologous areas are stronger than between non-homologous areas. Also significant bisexual difference is found for ridge count correlations between palmar areas in right hands and between non-homologous regions.

INTRODUCTION

Investigations on bilateral ridge count asymmetry and correlation of ridge count scores between various configurational areas are interesting dermatoglyphic markers in the population variation studies. Cummins and Midlo (1961) recognised asymmetry in homologous region of fingers and palms for various aspects of dermatoglyphics. Several studies have established a clear distributional variation of finger ridge count asymmetry among various world populations. Holt (1957) conducted systematic family studies for the quantitative bilateral ridge count asymmetry and opined that the total ridge count may be inherited through simple additive genes without environmental effects. Singh (1970) felt that asymmetry has a high environmental component and a very little hereditary influence. Mi and Rishad (1975) found a small fraction of variance due to dominance in addition to the additive genetic vari-

ance. Malhotra et al. (1991) opined that certain dermatoglyphic areas like thumb and a-b interdigital areas are more vulnerable to development stress and environmental influence compared to other areas.

Several investigations have also attempted to evaluate correlation of ridge counts between various dermatoglyphic areas. Jantz (1977), Leguebe et al. (1981) and Malhotra and Reddy (1986) have reviewed the data on correlation of ridge counts between various configurational areas and established variation on the lines of laterality, sex and race. Roberts et al. (1974) have observed relatively higher correlations among men than women while a reverse trend was reported by Jantz (1977). Mavalwala (1962) and Knussmann (1967) have reported little or absence of sex difference in ridge count correlations. In majority of the reports the correlations between homologous areas are more stronger than those between non-homologous areas.

All these studies have considered ridge counts of fingers only. No substantial attempts were made to test these hypotheses on palmar ridge counts. Hence, in the present study, palm prints of the Manne Dora, a settled agricultural tribe from Andhra Pradesh were analyzed to evaluate (i) the extent of variation in the distribution of ridge counts in three interdigital areas, viz., a-b-, b-c and c-d (ii) ridge count asymmetry and diversity between men and women, and (iii) correlations between palmar dermatoglyphic areas for their ridge counts and finally to examine the correlation variations on the lines of laterality and sex.

MATERIALS AND METHODS

Bilateral palm prints from 97 men and 109

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women belonging to Manne Dora tribe inhabiting plain areas of Vizianagaram and Visakhapatnam districts from Andhra Pradesh were used for the present analysis. The ridge counts of three palmar interdigital areas viz., a-b, b-c and c-d for each hand were scored after Holt (1968).

The bilateral ridge count asymmetry for each interdigital areas was ascertained through the following two measures.

1. Mean Directional Asymmetry (MDA) is obtained by using the ridge count score of each palmar area in right hand minus its homologue in left hand. The formula is :

$$MDA = \frac{\sum_{i=1}^n (R_i - L_i)}{n}$$

2. Mean Absolute Asymmetry (MAA) is obtained by summation of the difference in the ridge count between right and left hands ignoring the sign as per the above formula.

The correlation coefficients between ridge counts of all palmar dermatoglyphic areas were computed. The t-tests were employed to test the significance of variation between different groups in the distribution of ridge counts, asymmetry and correlations.

RESULTS AND DISCUSSION

The mean values for interdigital a-b, b-c and c-d ridge counts for both the palms among men and women are presented in table 1. Manne Dora men recorded higher a-b ridge counts than women, which is a statistically sig-

Table 1: Distribution of palmar ridge counts among Manne Dora tribe

Sex/Inter-digital area	Right	Left	t-value for bilateral variations
	Mean \pm SE	Mean \pm SE	
<i>Men (n=97)</i>			
a-b	39.69 \pm 0.66	39.53 \pm 0.69	0.1721
b-c	27.58 \pm 0.62	28.44 \pm 0.63	0.9695
c-d	35.43 \pm 0.62	35.21 \pm 0.58	0.2670
<i>Women (n=109)</i>			
a-b	37.10 \pm 0.51	37.15 \pm 0.58	0.0592
b-c	27.48 \pm 0.49	28.71 \pm 0.48	1.8121
c-d	33.23 \pm 0.61	35.74 \pm 0.51	3.1434**
<i>t-value for bisexual variation</i>			
a-b	3.0887**	2.6336**	
b-c	0.1268	0.3415	
c-d	2.5268*	0.6920	

* $p < 0.05$; ** $p < 0.01$

nificant difference. The bisexual difference for b-c and c-d ridge counts are not significant. The left hands recorded slightly higher mean values than the right except in the case of a-b ridge count among men. The c-d count in women shows a statistically significant bimodal difference. Studies on other Indian populations (Bhasin, 1967; Bhanu and Malhotra 1969; Sarkar 1991, etc.) also recorded more number of ridges on left hands than on right hands.

Ridge Count Asymmetry

Table 2 presents the mean values of directional and absolute ridge count asymmetry (MDA and MAA) of three palmar dermatoglyphic areas in men and women of Manne

Table 2: Distribution of mean directional asymmetry (MDA) and mean absolute asymmetry (MAA) among Manne Dora tribe

Interdigital area	MDA (Mean \pm SE)		MAA (Mean \pm SE)	
	Men	Women	Men	Women
a-b	-0.4021 \pm 0.49	0.5229 \pm 0.47	3.7010 \pm 0.32	3.5138 \pm 0.32
b-c	-0.3086 \pm 0.60	-0.5484 \pm 0.43	4.1605 \pm 0.39	3.1935 \pm 0.27
c-d	0.4691 \pm 0.62	-1.4516 \pm 0.52	4.1978 \pm 0.42	4.0323 \pm 0.34
<i>t-values for bisexual variation</i>				
a-b	1.3624	0.4137		
b-c	0.3249	2.0386*		
c-d	2.3736*	0.3063		

* $p < 0.05$

Dora tribe. The highest mean directional asymmetry (MDA) is noticed in c-d in men and a-b in women. The bisexual difference for ridge county asymmetry (directional) is significant for only c-d interdigital area. The maximum value of mean absolute asymmetry (MAA) is recorded in the c-d interdigital area in both the sexes followed by b-c in men and a-b in women. The bisexual difference for MAA is significant in only b-c interdigital area due to higher MAA values in men.

Ridge Count Correlations

The correlation coefficients between ridge counts of different palmar dermatoglyphic areas are computed and the mean values are shown in table 3. The mean value of correlation coefficients between right palmar areas is higher in men, while in women left hands show higher mean correlation coefficient. The bisexual and bimanual differences are significant. The homologous areas among both the sexes record stronger correlations than non-homologous areas with statistically significant differences. Jantz (1977) and Malhotra and Reddy (1986) emphasised the patterning of ridge count correlations on racial and ethnic lines.

Table 3: Mean values of correlation coefficients for ridge counts among Manne Dora tribe

Category	Men	Women	t-value for bisexual variation
	Mean±SE	Mean±SE	
Right hand	0.49 ± 0.14	0.16 ± 0.03	2.3048*
Left hand	0.03 ± 0.17	0.31 ± 0.05	1.5801
t-value for bilateral variation			
	2.1361*	2.5725*	
Homologous areas			
	0.57 ± 0.12	0.50 ± 0.09	0.3500
Non-homologous area			
	0.12 ± 0.03	0.27 ± 0.04	3.0000**
t-value between homologous and non homologous areas			
	3.6380***	2.3353*	
Total areas	0.33 ± 0.09	0.31 ± 0.05	0.1943

*p<0.05; **p<0.01; ***p<0.001

Investigations dealing with ridge count asymmetry and correlations are scanty in Indian populations and hence studies on this direction may be recommended to establish the affinities between various ethnic, geographical and linguistic groups of diverse cultures.

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