

Finger Ridge Count Correlations Among Four Tribes of Andhra Pradesh, India

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ABSTRACT

The present paper reports the distribution of finger ridge count correlations among four tribal populations from Andhra Pradesh, India viz., Dulia, Kotia, Manne Dora and Manzai Mali, and examines the intra and inter population variation. Higher correlations are recorded in left hands compared to right hands, but they are not significant. The homologous fingers exhibit a stronger correlation. In all the tribes, the correlations between right hand fingers are relatively higher among women when compared to men. Regarding inter population variation Dulia men differ significantly from the men of Manne Dora and the Manzai Mali tribes, and Kotia women also differ from the women of the Manne Dora significantly. The average correlation coefficient of the present populations is similar to other Indian populations reported earlier but lower than African and European populations.

Introduction

The correlation of dermal ridge counts on fingers is an interesting population variation marker. Jantz¹, Leguebe et al.² and Malhotra and Reddy³ have reviewed several studies on world populations to establish the variation of finger ridge count correlations along the lines of ethnicity, laterality and sex. Although most of the studies confirmed ethnic variation and reported higher correlations between

homologous fingers, the results are not consistent for laterality and sex.

In the present study, the finger ridge counts of four settled agricultural tribes viz., Dulia, Kotia, Manne Dora and Manzai Mali from the State of Andhra Pradesh, India were analysed to evaluate the intra and inter population variability of correlations between ridge counts of dif-

ferent fingers and also to examine whether the present data corroborate the variation on the lines of ethnicity, laterality and sex hypothesized in earlier studies. All these tribes inhabit the Eastern Ghats, spread over the borders of Andhra Pradesh and Orissa states and speak a dialect called *Adiwasi-Oriya*, belonging to Indo-Aryan group of languages. The ethnographic and demographic details of these tribes are available elsewhere^{4,5}.

Materials and Methods

Bilateral inked finger prints from 491 men and 463 women belonging to four tribes *viz.*, Dulia (118 men, 94 women), Kotia (109 men, 128 women), Manne Dora (97 men, 109 women) and Manzai Mali (167 men, 132 women) inhabiting the Eastern ghats of Visakhapatnam district, Andhra Pradesh were analysed by following Cummins and Midlo⁶. The Pearson's coefficients of correlation (r) between ridge counts of fingers were computed. The coefficients of correlation were obtained for all possible pairs from 10 finger ridge counts (45 pairs per each sex in each tribe), and grouped into different comparable categories such as left/right, homologous/non-homologous in each sex/tribe. The averages were obtained for each comparable category and the number of correlation coefficients averaged varies from category to category. It is 10 within hand, 5 for homologous fingers, 20 for non-homologous fingers and 45 for all fingers combined. The unpaired t-test was employed to test the significance of variation between averages of correlation coefficients of different categories.

Results

The mean values with corresponding standard deviation for correlation coefficients for various categories *i.e.*, between fingers of right hand, between fingers of

left hand, between homologous fingers, between non-homologous fingers and between all 45 combinations of the 10 fingers are given in Table 1. The results exhibit intra population variability with regard to laterality, sex and homologous/non-homologous fingers in the ridge count correlations. A majority of populations recorded a relatively higher correlation between left hand fingers than right hand fingers except Dulia women and Kotia men. But these differences are not significant. The ridge counts of homologous fingers are strongly correlated compared to non-homologous fingers and the differences are significant in all populations. The sex differences are marginal in all the tribes for correlations between finger ridge counts. When all the 45 correlation combinations are considered, women of all tribes except Dulia recorded higher correlations than their men counterparts. Among Kotia, the average ridge count correlations are significantly higher in women than in men. The t-tests for inter population differences reveal that Dulia men differ significantly from men of Manne Dora ($t = 2.8127$; $p < 0.01$) and Manzai Mali ($t = 2.4645$, $p < 0.05$) while Kotia women show significant difference with Manne Dora women ($t = 1.9699$; $p < 0.05$).

Discussion

The results are compared with other Indian and World populations by using the average correlation coefficient of each population to examine the extent of ethnic variation. The average correlation coefficient of present tribes (0.5497) is nearer to the averages of other Indian populations (0.5511 and 0.5466) from the State of Maharashtra reported by Malhotra et al.^{7,8} The populations of Maharashtra speak in a language of Indo-Aryan group. The present study tribal populations speak *Adiwasi-Oriya*, a dialect also belonging to Indo-Aryan group linguisti-

TABLE 1
AVERAGES OF INTERFINGER RIDGE COUNT CORRELATION COEFFICIENT
AMONG FOUR TRIBAL POPULATIONS

Tribe / Comparable category	Men		Women		t- value ³
	Mean	SD	Mean	SD	
Dulia					
Right hands	0.5455	0.0617	0.5674	0.1092	0.5236
Left hands	0.5973	0.0612	0.5329	0.1011	1.6348
t-value ¹	1.7867		0.6955		
Homologous fingers	0.7039	0.0892	0.7078	0.0610	0.0722
Non-homologous fingers	0.5607	0.0687	0.5447	0.0142	0.9913
t-values ²	3.0265*		5.3165***		
Total fingers	0.5767	0.0795	0.5629	0.1123	0.6658
Kotia					
Right hands	0.5316	0.1623	0.5708	0.0875	0.6376
Left hands	0.5076	0.1442	0.6234	0.0894	2.0465*
t-value ¹	0.3315		1.2607		
Homologous fingers	0.7538	0.0443	0.7457	0.0589	0.2198
Non-homologous fingers	0.5164	1.1385	0.5838	0.0878	2.7266**
t-values ²	7.7954***		5.0166***		
Total fingers	0.5427	0.1489	0.6015	0.1012	2.1676*
Manne Dora					
Right hands	0.4590	0.1622	0.4998	0.2485	0.4125
Left hands	0.5205	0.1002	0.5419	0.1086	0.4345
t-value ¹	0.9673		0.4659		
Homologous fingers	0.6507	0.0887	0.7221	0.0345	1.4984
Non-homologous fingers	0.4936	0.1243	0.5254	0.1438	0.7293
t-values ²	2.9776**		5.2792***		
Total fingers	0.5110	0.1346	0.5473	0.1542	1.1775
Manzai Mali					
Right hands	0.4521	0.1789	0.5175	0.1218	0.3583
Left hands	0.5451	0.0687	0.5427	0.1041	0.0577
t-value ¹	1.4566		0.1432		
Homologous fingers	0.6888	0.0789	0.7143	0.0742	0.4709
Non-homologous fingers	0.4985	0.1436	0.5278	0.0897	0.7548
t-values ²	3.7046**		4.3949***		
Total fingers	0.5170	0.1418	0.5485	0.1145	1.1447

¹ for bilateral difference (df = 18); ² for difference between homologous and non-homologous categories (df = 23); ³ for bisexual difference (df = 18 for within hand, df = 8 for homologous category, df = ∞ for non-homologous category and for total fingers).

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

cally. The Parsis of India, a migrant population from Iran, also recorded a mean correlation coefficient of 0.55⁹. However, Indian populations differ considerably from African populations reported by Roberts et al.¹⁰ and Jantz¹, who recorded the highest average correlation coefficient (0.65) than all other world populations. The populations with European ancestry from America¹, Belgium², England¹¹ and Germany^{12,13} recorded an average correlation coefficient of 0.59, which is slightly higher than the Indian populations (0.55) as well as Mongoloids (0.55) reported by Leguebe et al.² and Vrydagh and Breguet¹⁴.

Although, the majority of the studies exhibit variability for laterality and sex, they are not consistent. The relatively higher correlations of left hand fingers than right hand fingers in the present study populations are in conformity with other World populations. Among Indian men sampled from 27 populations^{7,8}, 15 groups recorded higher correlation between right hand fingers compared to left hand fingers. Consistently stronger correlations between homologous fingers are recorded in all the World populations and Indian populations including the present

tribes. A study on Central European populations also showed that the homologous fingers correlate most strongly with each other¹⁵. Mavalwala⁹ and Knussmann¹³ have reported little or absence of sex difference while a few studies recorded sex differences in the ridge count correlations. Roberts et al.¹⁰ and Brehme et al.¹² have observed relatively higher correlations among men than women, while an inverse trend was reported by Jantz¹, which indicates the absence of a uniform trend. From this discussion, it is clear that dermatoglyphic markers are complex for interpretation in population variation studies. However, it is well known that ridge counts are widely used in population variation studies. Recent studies indicated that ridge count distances show significant correlation with geographic distance of populations, and also shows even higher correlation with blood marker distances¹⁶. Another recent study from India¹⁷ concluded that the pattern of variation observed in dermatoglyphic variables and genetic markers are consistent with different dimensions of population structure whereas dermatoglyphic variables conform more to the geographic pattern and less to ethnic resemblances.

REFERENCE

1. JANTZ, R. L., *Am. J. Phys. Anthropol.*, 46 (1977) 171. — 2. LEGUEBE, A., S. VRYDAGH, J. D. DUCROS, *J. Hum. Evol.*, 10 (1981) 453. — 3. MALHOTRA, K. C., B. M. REDDY, *Curr. Anthropol.*, 27 (1986) 74. — 4. SACHCHIDANANDA, R., R. PRASAD: *Encyclopaedic profile of Indian tribes*. (Discovery Publishing House, New Delhi, 1995). — 5. BABU, B.V.: *A population genetic study of sub-tribes of Mali from Andhra Pradesh*. Ph.D. Thesis. (Andhra University, Visakhapatnam, 1993). — 6. CUMMINS, H. C., C. MIDLO: *Finger prints, palms and soles: an introduction to dermatoglyphics*. (Dover Publications Inc., New York, 1961). — 7. MALHOTRA, K. C., R. CHAKRABORTY, B. V. BHANU: *The correlations between ridge counts on different fingers among 20 Dhangar castes of Maharashtra*. Technical Report: *Anthropology*, 2/84. (Indian Statistical Institute, Calcutta, 1984). — 8. MALHOTRA, K. C., R. CHAKRABORTY, B. V. BHANU, R. B. KAZI: *The correlations between ridge counts on different fingers and the relationship between TFRC, ATFCR, FPII: Indian data*. Technical Report: *Anthropology*, 3/78. (Indian Statistical Institute, Calcutta, 1978). — 9. MAVALWALA, J. D., *Ann. Hum. Genet.*, 26 (1962) 137. — 10. ROBERTS, D. F., J. CHAVEZ, A. REDMAYNE, *Man*, 9 (1974) 31. — 11. HOLT, S. B., *Ann. Eugenics*, 16 (1951) 287. — 12. BREHME, H., V. RIEDEL, H. BAITSCH, *Anthropol. Anz.*, 28 (1996) 285. — 13. KNUSSMANN, R., *Human-genetik*, 4 (1967) 221. — 14. VRYDAGH, S., G. BRUGUET, *Bull. Soc. Royale Belge d'Anthropol. Prehist.*, 92 (1981) 87. — 15. KUNTER, M., M. RUHE, *Anthropol. Anz.*, 53 (1995) 79. — 16. JANTZ, R. L., *Ann. Hum. Biol.*, 24 (1997) 97. — 17. REDDY, B. M., V. P. CHOPRA, B. KARMAKAR, K. C. MALHOTRA, H. MUELLER, *Am. J. Hum. Biol.*, 12 (2000) 315.

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MEĐUKORELIRANOST BROJA GREBENA NA PRSTIMA U ČETIRI PLEMENA ANDHRA PRADESH, INDIJA

S A Ž E T A K

U radu je prikazana međukoreliranost te unutar- i među-populacijska varijabilnost broja grebena na prstima kod četiri plemenske populacije iz Andhra Pradesh, Indija (plemena: Dulia, Kotia, Manne Dora i Manzai Mali). Viša koreliranost zabilježena je za broj grebena na lijevoj ruci nego na desnoj, no razlika nije bila značajna. Homologni prsti pokazali su snažniju korelaciju. U sva četiri plemena, korelacije između prstiju desne ruke bile su relativno snažnije u žena nego u muškaraca. U odnosu na među-populacijsku varijabilnost, muškarci iz plemena Dulia značajno su se razlikovali od muškaraca iz Manne Dora i Manzai Mali. Žene iz plemena Kotia značajno su se razlikovale od žena iz plemena Manne Dora. Ovdje prikazane prosječne vrijednosti koeficijentata korelacije sukladne su ranije objavljenim vrijednostima za druge populacije Indije, međutim niže su od korelacija o pronađenim za populacije Afrike i Europe.