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Inbreeding Effects of Fingerprint Patterns Among Qureshi Muslims and Other Indian Populations

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ABSTRACT The present comparative analysis is based on fingerprint data of different populations from different parts of India. Fingerprints in case of present Qureshi (Muslim) males and females indicate the trend of an increase of whorls and arches in the offspring of consanguineous marriage. But the difference is significant only in cases of individuals with higher inbreeding coefficients ($F \geq 0.0625$). The increase of the frequencies of whorls and reaial loops with inbreeding also tend to be greater in the females than in males. The genetic significance of the homozygous effects, dermatolyphic studies on inbred and non-inbred offspring in general have found to be more convenient.

INTRODUCTION

Sabarni and Mukherjee (1976) observed an excess of whorls and arches, and a reduced frequency of ulnar loops on fingers of some daughters of first cousins compared to the daughters of unrelated parents within the Reddy caste of Andhra Pradesh, India, This have given rise to the hypothesis of a few pairs of additive alleles for high and low pattern intensities which is compatible familial correlations for total number of triradii on fingers in several populations (Mukherjee, 1966; Loesch, 1971; Barnicot et al., 1972). Evidence of similar inbreeding effects has been directly obtained in controlled data from other populations in India (Mukherjee, 1984; Mukherjee et al., 1980, 1990) and indirectly in that from the offspring of endogamous and exogamous marriages elsewhere (Meier, 1966; Gomilia et al., 1967; Roberts et al., 1971; Marquer and Jacobi, 1976)

These results, suggesting homozygosity of extreme pattern intensities on fingers, and also agree with results on studies on the effects of village endogany, which shows indirect effects of inbreeding. The present paper is an attempt to verify the hypothesis of the extreme pattern intensities on fingers and heterozygosity of the pattern with the middle range of intensity which support some additve effect of the concerned alleles (Mukerjee, 1966; Loesch, 1971), by a comparative study with a new data from the endogamous Qureshi Muslim population of Aligarh city in India.

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MATERIAL AND METHODS

The present study was conducted in Aligarh city of the Uttar Pradesh (U.P.) State. The demographic characteristics of the district are fairly typical of that prevailing in other parts of the state. As per 1991 census, the Muslim population in Aligarh city is about 34.5% of the total population.

The Muslims of Aligarh city like elsewhere are predominantly Sunnis; though a considerable number of Shias are also there. Among the Sunnis, approximately, one fourth of the population represents Syed, Sheikh, Moghal and Pathan groups who have social precedence while three - fourth belong to various other endogamous groups with lower social-ranks. A sizable proportion among the latter groups of Muslims are of Ansari and Qureshi groups.

The Qureshis by profession are meat sellers and lock makers. They have either their own slaughter house (5%) or work as labourers in slaughter house, thus supplying

different types of meat throughout the district. About 95% of the Qureshi population belong to this labour class and the data for the present study have been collected from this section of the population to control for environmental variation.

The analysis is based on finger prints of 76 males and 80 female offspring of unrelated parents, 95, 95, 85 male offspring of second cousins, first cousins once removed and first cousins respectively; in case of female offspring the sample of same categories are 100, 105, 85, respectively. Total sample size was 721 (351 males and 370 females).

The coefficients of inbreeding (F) for autosomal genes were calculated from the pedigree data using slightly modified Wright's (1922) formula : $F = \Sigma (1/2)^n (1 + Fa)$ where n is the number of persons along the path through a common ancestor connecting two parental gametes and F_a the inbreeding coefficient of that common ascestor. However, as verified from the pedigrees, the inbreeding coefficients of common or most of the ancestors of parents (F_a) pointed out to be zero in all cases. Therefore, to use sizable samples of subjects with same F values, the rare cases with same values of F in common ancestors were left out from this study. Assuming that very little errors exist in calculating the F values obtained for the subjects, it can be strictly considered as the minimum estimates of F-values.

The present analysis is focussed upon changes in grades or intensities of finger print patterns on inbreeding in different populations. Therefore, the occurrence of patterns associated with 0, 1 and 2 triradii on single fingers and that of low medium and high ranges of triradial numbers on all fingers (trN) are compared between different inbreeding levels, as measured by F, in samples of either sex in each population. Mean trN is also estimated for each inbreeding class. The very small samples for two different levels of high inbreeding (F>0.0625) are, however, pooled as one group in the Sheik Muslim data from west Bengal.

Table 1 : Per cent frequencies of patterns with 0, 1 and 2 triradii-Arch (A), Tented Arch/Loop (T/L) and Whorl (W) in order on fingers of males having different inbreeding coefficients (F) in some populations. Estimates for the total inbred sample (F > 0) from each population are underlined

Population	*F*	*Fingers*	*Number of triradii in per cent)*		
			0	*1*	*2*
			A	*T/L*	*W*
Queshi of Aligarh,	.0000	760	2.3	52.2	45.5
Uttar Pradesh	.0156	950	2.6	51.1	46.3
(Present)	.0312	950	3.3	49.4	47.3
	.0625	850	3.9*	47.2*	48.9*
	.0360	2750	3.2	49.3	47.5
Sheik of Memari,	.0000	710	1.8	56.4	41.8
West Bengal	.0625	400	1.5	55.5	43.0
(Mukherjee, A, 1990;	.1166	130	4.6	51.6	43.8
Mukherjee et al., 1990)	.0754	540	2.2	54.5	43.3
Pokanati Reddy of	.0000	1570	1.6	67.7	30.7
Chittoor, Andhra Pradesh	.0625	340	5.9*	48.2*	45.9*
(Mukherjee, A., 1990;	.1250	440	6.4*	52.0*	41.6*
Mukherjee, D.P., 1990)	.0969	790	7.0	50.0	43.0
Mala of Chittoor,	.0000	850	2.1	60.5	37.4
Andhra Pradesh	.0625	450	1.8	53.8*	44.4*
(Mukherjee, A., 1990	.0676	490	1.9	55.6	42.5
Mukherjee et al., 1980)					

* P < 0.05, using Chi-square test

RESULTS AND DISCUSSION

The tables 1 and 2 show the trend of increase of whorls and arches with decrease of patterns with single triradii (tented arches and loops) on single fingers in both males and females, as inbreeding progresses. The similar effects also have been found in low inbreeding (0<F<0.0625) as of high inbreeding. However, the χ^2 values for 2 d.f. for the change of pattern frequencies are significant at 5% probability level only for higher inbreeding levels ($F \geq 0.0625$) in all female samples and in three of the four male samples except Sheik Muslim sample. The

Table 2 : Per cent frequncies of patterns with 0, 1 and 2 triradii - Arch (A), Tented Arch/Loop (T/L) and Whorl (W) in order - on fingers of females having different inbreeding coefficients (F) in some populations. Estimates for the the total inbred sample (F>0) from each population are underlined

Population	*F*	*Fingers*	*Number of triradii (in per cent)*		
			0	*1*	*2*
			A	*T/L*	*W*
Qureshi of Aligarh,	.0000	800	5.0	60.9	34.1
Uttar Pradesh	.0156	1000	3.8	52.5	43.7
(Present)	.0312	1050	4.9	49.5	45.6
	.0625	850	6.7*	46.7*	46.6*
	.0350	2900	5.1	49.7	45.2
Pokanati Reddy of Chittoor,	.0000	730	1.9	76.3	21.3
Andhra Pradesh	.0625	200	12.0*	44.0*	44.0*
(Mukherjee, A., 1990;	.1250	400	4.3*	48.2*	47.5*
Mukherjee, D.P., 1984)	.1018	620	6.8	48.0	45.2
Reddy of Chittoor,	.0000	1840	5.0	68.5	26.5
Andhra Pradesh	.0625	220	7.3*	54.0*	38.7*
(Mukherjee, A., 1990; Mukherjee et al., 1980)					

* $P < 0.05$, using Chi-square test

Table 3 : Mean values of total number of triradii (trNF) on fingers in males (m) and females (f) of different inbreeding classes of different populations

Population	*Sex*	*F*		*trNF (in per cent)*				
				Low	*Middle*	*High*		
Qureshi	m		Range	8-9	10-14	15-20	Mean	se
		.0000		1.3	71.4	27.3	14.33	.4
		.0156		6.3	49.5	44.2	14.37	.3
		.0313		10.6	39.0	50.7	14.40	.3
		.0625		15.6	33.7	50.7	14.50	.4
		.0360		10.7	42.5	46.8	14.42	.2
	f		Range	6-8	9-13	14-20		
		.0000		7.6	60.1	32.3	12.91	.4
		.0156		9.0	34.0	57.0	13.99	.4
		.0313		10.5	26.7	62.8	14.07	.4
		.0625		16.4	22.4	61.2	13.99	.5
		.0350		11.8	29.8	60.4	14.02	.2
Pokanati	m		Range	6-10	11-15	16-20		
		.0000		21.0	60.5	18.5	12.91	.2
		.0625		23.5	23.5	53.0	14.00	.7
		.1250		31.8	31.8	36.4	13.52	.6
		.0969		29.2	27.8	43.0	13.60	.4
	f		Range	3-7	8-14	15-20		
		.0000		0.0	84.9	15.1	11.99	.3
		.0625		20.0	30.0	30.0	13.20	1.1
		.1250		7.5	32.5	60.0	14.32	.7
		.1018		11.3	33.9	54.8	13.84	.6
Sheik	m		Range	6-10	11-15	16-20		
		.0000		14.1	52.1	33.8	14.00	.4
		.0625		15.0	47.0	37.0	14.20	.6
		.1166		23.1	30.8	46.9	13.92	.9
		.0754		16.7	44.4	38.9	14.11	.5
Mala	m		Range	5-11	12-15	16-20		
		.0000		32.9	37.7	29.4	13.53	.4
		.0625		33.3	24.5	42.2	14.27	.6
		.0676		34.7	26.5	38.8	14.06	.5

non-significant difference in the change of pattern intensities in Skeik Muslim sample from West Bengal (Mukherjee, A., 1990) can be explained by a high degree of homozygosity of non-inbred (F=0) males and /or close consanguinity between members of differed inbreeding groups that are compared.

However, it has been kept in mind that this excercise has a limitation, as the small sample size of each category of classes of inbreeding of each sex, of course, lead to the hazards of sample fluctuation with this limitation. While it is found impracticable to procure adequate samples for different inbreeding levels from single gene pools to test the significance of these findings. The general trend of increase of whorls, and plain arches at the cost of tented arches and loops in particular, with inbreeding can be traced in male with occasional errors of sampling but it is more consistent in females in general. Therefore, the results of this analysis strengthen the hypothesis of common genes for ridge pattern and their homozygosity.

The mean value of total number of triradii on fingers per individual appears to increase with inbreeding coefficient in male sample from Qureshi (Table 3). Thus the differences between any two levels of inbreeding, are not singnificant at 5% level of probability in either sex. It could also be noted that the magnitude of increase of mean trNF in the inbred individuals and especially in the offspring of second cousins is greater in the female sex than in the male. However, the absence of significant changes of mean trNF on inbreeding in the accumulated data cast further doubt on the applicability of the hypothesis of some average recessiveness of genes with positive effects for pattern intensity on fingers. Therefore, the issue of genetic implication or additive model for the extreme pattern intensities on fingers is still open for further investigation by collecting adequate data along with the genetical structure of concerned populations.

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