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Anthropometric affinities among the 20 endogamous groups of Dhangars of Maharashtra, India

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With 2 figures and 4 tables in the text

Abstract: Fourteen anthropometric measurements were used to examine the affinities among 20 Dhangar castes of Maharashtra, in a sample of 2437 adult males. The results are interpreted in the light of their ethnohistorical and geographical backgrounds on the one hand and with reference to the affinities observed on the basis of other biological variables, different sets of qualitative and quantitative dermatoglyphic variables and genetic markers, on the other. The configuration of anthropometric distances is largely conformatory to the geographical backgrounds of the groups, and there is no significant correspondence with the dendrograms based on the other sets of variables which are mutually independent among them.

Zusammenfassung: An einer Stichprobe von 2437 Männern werden mit Hilfe von 14 anthropologischen Maßen die Zusammenhänge zwischen 20 Dhangar-Kasten aus Maharashtra untersucht. Die Interpretation der Ergebnisse geht einerseits von der ethnohistorischen und geographischen Seite aus und berücksichtigt andererseits die auf der Basis anderer biologischer Merkmale im Bereich der Hautleisten und genetic markers bereits beobachteten Zusammenhänge. Die anthropometrischen Distanzen zeigen eine enge Beziehung zur geographischen Herkunft der Gruppen; signifikante Zusammenhänge mit Dendrogrammen, die auf der Basis anderer Merkmale erstellt wurden, ergeben sich nicht.

Introduction

As part of a multidisciplinary study among the seminomadic Dhangars of Maharashtra, data on different sets of biological variables, blood samples, anthropometric measurements, finger and palm prints etc., were generated to delineate the biological make-up of this shepherd caste cluster. A series of papers report findings on the nature of variation and the population affinities among them with reference to genetic markers (Das et al. 1974, Chakraborty et al. 1977, Malhotra et al. 1977, 1978, Mukherjee et al. 1976, 1977), finger and palmar dermatoglyphics (Malhotra 1979c, Chakraborty & Malhotra 1981, Karmakar et al. 1988) besides several aspects of population structure (Majumder & Malhotra 1977, Malhotra 1977a, b, Malhotra 1984) and ecology (Gadgil & Malhotra 1979, 1982, Malhotra & Gadgil 1981, 1984, 1988). We have not so far reported findings on anthropometric variation among them. Given the generally observed incongruence in the pattern of population relationships with reference to different sets of variables (Chai 1972, Neel et al. 1974, Friedlaender 1975, Jantz & Chopra 1983, Reddy et al. 1987, 1988) it is necessary to examine as many diverse

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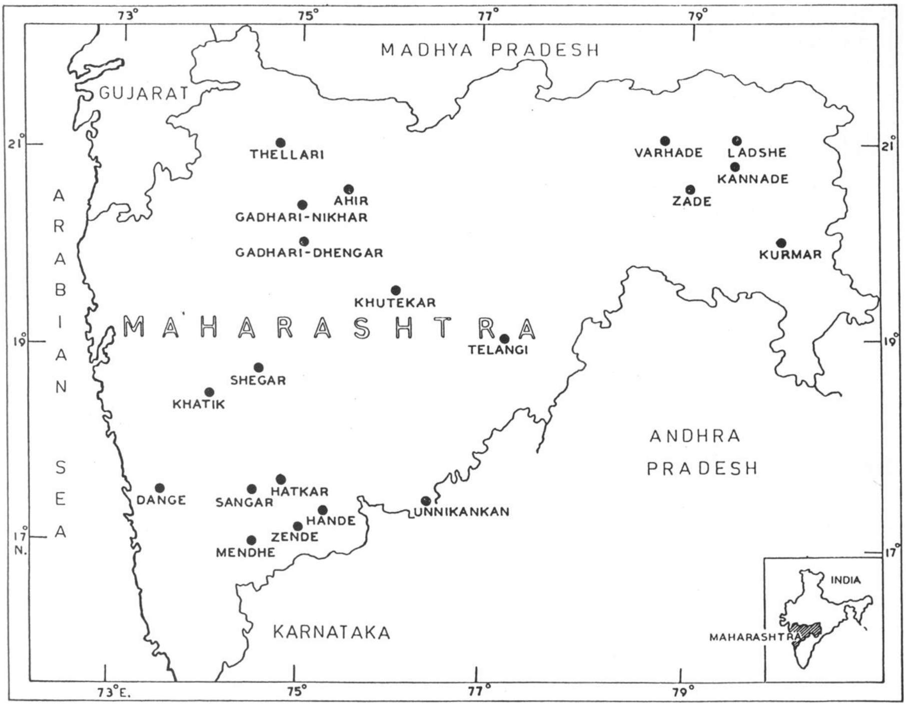

Fig. 1. Map of Maharashtra showing the focal areas of the distribution of the twenty Dhangar castes.

sets of biological variables as possible to arrive at an understanding of the biological relationships of the concerned populations vis-a-vis their ethnohistorical and geographical backgrounds. The present paper therefore deals with the anthropometric variation among the 20 endogamous groups of Dhangars in the light of known ethnohistorical and geographical backgrounds, and with reference to the distance configurations observed in case of the other sets of variables.

Population backgrounds

Since several earlier papers reported most details on the Dhangars we shall give here only a brief account. Dhangars, estimated to number about 3 million, are a nomadic caste cluster, constituting a total of 23 endogamous castes. They are distributed all over Maharashtra (Fig. 1), and speak four different languages – Marathi, Hindi, Kannada and Telugu. While some of these groups are highly localized, some are widely distributed, this variation in distribution being largely dependent on their numerical strengths (Table 1); some of them number only a few thousands, whereas there are others whose number exceed hundred thousands. There is also variation in the mode of their traditional occupations; some are shepherds, others weave woolen products, yet some others do agriculture, cattle breeding and selling meat.

The rate of admixture among the different Dhangar castes amounts to only about 1 in 1000 marriages. The archaeological evidence and ethnographic data further

Table 1. Dhangar castes, abbreviations and sample sizes, along with the estimated population sizes, mother tongue and occupation.

No.	Population	Abbreviation	N	Estimated population	Mother tongue	Occupation*
1	Ahir	AH	241	300 000	Ahrani	SK/WW
2	Dange	DA	154	100 000	Marathi	BK
3	Gadhari-Dhengar	GD	66	20 000	Hindi	SK
4	Gadhari-Nikhar	GN	50	5 000	Hindi	SK/WW
5	Hande	HA	58	4 000	Kannada	SK
6	Hatkar	HT	449	573 000	Marathi	SK
7	Kannade	KA	52	15 000	Marathi	SK
8	Khatik	KK	125	15 000	Marathi	MS
9	Khutekar	KR	368	550 000	Marathi	SK/WW
10	Kurmar	KU	88	20 000	Kannada	SK/WW
11	Ladshe	LA	92	6 000	Marathi	SK/CW
12	Mendhe	ME	113	30 000	Marathi	SK/WW
13	Sangar	SA	73	10 000	Marathi	WW
14	Shegar	SH	63	40 000	Marathi	SK/WW
15	Telangi	TE	55	5 000	Telugu	SK/WW
16	Thellari	TH	94	7 000	Marathi	SK/CK
17	Unnikankan	UN	57	6 000	Marathi	SK/WW
18	Varhade	VA	57	150 000	Marathi	SK/CW
19	Zade	ZA	62	15 000	Marathi	SK/WW
20	Zende	ZE	120	80 000	Marathi	SK/HK
	Total		2 437			

* SK = Sheep keeping; WW = Woolen weaving; MS = Meat selling; CW = Cotton weaving; CK = Cattle keeping; HK = Horse keeping; BK = Buffalo keeping.

suggests that the contemporary Dhangar castes are the result of more than one migration from north-west India, between 4000 A.D. and 10,000 A.D. (ALLCHIN 1963).

Data and sampling

The twenty Dhangar castes studied and the sample sizes are furnished in Table 1. The list of anthropometric measurements and their abbreviations are given in Table 2. The 14 anthropometric measurements, excepting vertex height and tragus height, are concentrated on the head and face, and are observed to be useful in delineating ethnic characteristics. The anthropometric measurements were collected on a total of 2437 adult males from the 20 endogamous groups by stratified random sampling design prepared by Drs. T. V. HANURAO and R. CHAKRABORTY of the Indian Statistical Institute. The field work was conducted during 1970–1974. The data were drawn from 177 villages spread over 82 Tahsils of all the 26 districts of Maharashtra state in India.

Table 2. List of anthropometric variables studied and the abbreviations used.

Sl.No.	Variables	Abbreviation used
1	Height vertex	HV
2	Height tragus	HT
3	Head length	HL
4	Head breadth	HB
5	Minimal frontal breadth	MFB
6	Bizygomatic breadth	BZB
7	Bigonial breadth	BGB
8	Upper facial height	UFA
9	Nasal height	NH
10	Nasal breadth	NB
11	Biorbital breadth	BOB
12	Inter orbital breadth	IOB
13	Obritonosal arc	ONA
14	Head circumference	HC

Results

Univariate analysis

Means and SDs of the 14 anthropometric measurements among the 20 Dhangar castes, and the univariate F-ratios for inter group homogeneity are furnished in Table 3. All the anthropometric variables considered for the present study show significant population heterogeneity ($p < 0.01$). The heterogeneity is much greater in case of head breadth ($F = 21.19$, d.f.: 19, 2417), biorbital breadth ($F = 23.14$), orbitonasal arc ($F = 18.03$), bizygomatic breadth ($F = 15.9$) and minimum frontal breadth ($F = 11.24$), compared to the other measurements. As expected, Duncan's multiple range test suggests a greater number of pair-wise differences for these measurements with a few departures. For example, upper facial height shows significant population differences in as many as 101 of the 190 population pairs, whereas the most heterogeneous biorbital breadth with an F-value of 23.14 shows only in 90 pairs; obviously due to the relatively greater magnitude of interpopulation differences in case of the latter. Generally it is Zade, Sangar, Ladshe, Kurmar, and Khatik that showed the maximum number of pair-wise differences with the rest of the populations in each of the anthropometric measurements considered. Therefore, the significant amount of heterogeneity among the Dhangars is contributed by these groups.

Mahalanobis' D^2 and cluster analysis

Although the univariate results suggest significant intergroup heterogeneity, the overall pattern of variation is difficult to interpret because different variables may vary in several different directions. Furthermore, most of these anthropometric measurements are highly intercorrelated. Therefore, a multivariate approach is more appropriate. Since our basic objective is to assess biological affinities among the Dhangar castes, Mahalanobis' D^2 distance which is an overall measure of dissimilarity is computed between different pairs of populations using the

Table 3. Means and SDs of the anthropometric measurements among the 20 Dhangar castes, and the univariate F-ratios.

Sl. No.	Population	N	Height vertex Mean ± SD	Height tragus Mean ± SD	Head length Mean ± SD	Head breadth Mean ± SD	Minimum frontal breadth Mean ± SD	Bizygomatic breadth Mean ± SD
1	AH	241	1650.5 ± 60.5	1534.5 ± 60.6	184.3 ± 6.8	142.5 ± 5.7	103.1 ± 4.7	134.3 ± 5.3
2	DA	154	1616.3 ± 58.4	1502.3 ± 58.4	184.2 ± 6.9	142.0 ± 6.0	102.6 ± 3.8	131.5 ± 5.2
3	GD	66	1632.2 ± 51.8	1520.7 ± 49.4	184.0 ± 6.7	146.5 ± 5.4	104.4 ± 4.5	135.5 ± 5.3
4	GN	50	1644.2 ± 75.2	1536.1 ± 75.3	181.7 ± 6.2	142.4 ± 5.7	102.8 ± 4.4	133.6 ± 4.5
5	HA	58	1649.7 ± 73.0	1528.2 ± 69.7	181.2 ± 7.1	144.6 ± 5.6	102.6 ± 4.2	134.9 ± 5.1
6	HT	449	1642.6 ± 58.3	1528.8 ± 57.8	183.0 ± 7.4	145.7 ± 5.7	104.0 ± 4.4	135.3 ± 5.1
7	KA	52	1617.4 ± 61.3	1505.8 ± 59.6	182.4 ± 5.4	141.0 ± 5.0	101.6 ± 3.8	132.3 ± 5.5
8	KK	125	1646.0 ± 63.3	1527.8 ± 64.9	187.8 ± 8.6	147.8 ± 6.2	107.4 ± 4.8	138.0 ± 6.1
9	KR	368	1635.6 ± 54.7	1520.7 ± 55.0	182.9 ± 7.0	143.7 ± 6.4	103.2 ± 4.3	134.4 ± 5.6
10	KU	88	1616.8 ± 61.6	1506.9 ± 60.3	181.8 ± 5.7	137.6 ± 4.5	101.6 ± 3.8	129.8 ± 5.2
11	LA	92	1610.2 ± 57.4	1500.5 ± 58.6	182.3 ± 7.2	139.7 ± 6.0	101.1 ± 5.3	131.3 ± 5.0
12	ME	113	1632.5 ± 60.1	1510.5 ± 59.3	183.2 ± 7.4	144.0 ± 5.6	103.4 ± 4.5	134.2 ± 5.3
13	SA	73	1637.0 ± 50.0	1521.5 ± 49.8	181.2 ± 7.7	146.4 ± 6.0	104.5 ± 4.2	135.8 ± 5.2
14	SH	63	1642.8 ± 56.9	1519.4 ± 56.3	181.2 ± 6.9	143.6 ± 6.2	103.8 ± 4.3	135.2 ± 4.2
15	TE	55	1635.7 ± 53.3	1524.3 ± 52.7	183.8 ± 7.1	142.3 ± 4.5	102.2 ± 3.8	131.9 ± 4.2
16	TH	94	1625.0 ± 55.5	1515.5 ± 55.4	182.1 ± 7.0	142.6 ± 5.8	102.6 ± 4.3	131.8 ± 4.8
17	UN	57	1647.2 ± 48.0	1523.2 ± 48.1	183.4 ± 6.7	146.2 ± 5.8	103.2 ± 3.7	134.6 ± 5.3
18	VA	57	1627.0 ± 55.7	1505.5 ± 57.3	184.0 ± 6.2	141.4 ± 4.6	102.0 ± 4.1	134.4 ± 4.8
19	ZA	62	1609.9 ± 56.1	1495.0 ± 55.2	181.6 ± 6.0	140.2 ± 5.1	101.2 ± 5.1	130.9 ± 5.2
20	ZE	120	1639.7 ± 59.3	1519.8 ± 58.4	180.5 ± 8.2	146.5 ± 6.6	103.0 ± 4.2	135.2 ± 5.2
F-value			5.3	4.4	5.7	21.2	11.2	15.9

Table 3. (Continued).

Sl. No. Pop.	Bigonial breadth	Upper facial height	Nasal height	Nasal breadth	Biorbital breadth	Interorbital breadth	Orbitonasal arc	Head circumference
1	104.0±5.9	63.0±4.1	48.7±3.7	35.5±2.9	91.5±4.1	30.5±2.8	103.7±6.0	537.7±16.9
2	101.4±6.1	63.7±4.6	49.9±4.3	36.3±2.6	91.2±5.1	29.8±2.6	104.8±5.5	538.8±14.2
3	101.8±5.8	64.1±4.4	49.8±3.8	36.2±2.5	92.9±4.1	30.9±2.7	107.2±5.8	543.9±17.1
4	101.5±5.7	64.0±3.6	48.1±3.3	36.2±2.2	92.3±4.9	30.7±2.5	104.3±6.1	533.8±17.5
5	104.0±5.7	61.6±3.1	49.0±2.7	36.6±3.4	88.7±4.0	28.7±3.1	102.6±6.2	537.4±17.4
6	103.7±5.7	63.0±4.2	48.7±3.7	35.9±2.5	91.9±4.1	30.1±2.7	104.5±5.6	539.9±15.6
7	101.2±6.0	62.1±3.9	48.6±3.8	36.0±2.7	90.8±3.5	30.2±4.0	102.7±4.6	536.0±15.1
8	104.5±6.0	64.3±4.3	49.1±3.5	37.5±3.1	97.9±4.6	31.4±2.2	110.9±5.5	550.0±17.8
9	103.0±5.7	62.3±4.3	47.6±3.6	36.3±2.6	91.6±4.1	29.9±2.4	103.0±5.3	535.6±16.0
10	98.7±4.2	60.0±3.7	48.0±3.6	36.0±2.6	89.9±3.7	29.0±2.2	100.2±4.8	529.9±13.9
11	101.6±6.1	61.6±3.7	48.4±3.6	35.3±2.4	90.2±3.7	29.3±2.3	102.4±4.9	531.9±16.4
12	102.9±6.1	60.5±3.4	49.6±3.6	36.7±3.1	89.3±4.7	29.9±2.9	103.6±5.5	541.6±17.2
13	103.4±5.6	61.6±3.8	48.6±3.8	37.6±2.7	92.4±4.3	30.3±3.0	105.3±5.4	542.2±14.9
14	106.6±5.5	61.2±4.4	48.7±3.7	36.8±3.1	91.3±4.4	30.9±3.0	106.1±6.3	538.6±14.0
15	102.5±5.4	63.9±3.7	49.1±3.4	36.3±2.8	90.3±3.6	29.1±2.3	100.8±5.6	534.5±11.9
16	102.0±5.7	61.2±3.8	47.7±3.6	35.3±2..4	89.9±3.6	30.1±2.3	102.7±5.7	536.4±16.4
17	102.3±5.9	60.3±3.2	47.6±3.2	36.6±2.8	89.5±3.4	30.2±2.5	102.1±4.9	539.7±23.7
18	104.7±6.2	63.4±4.6	48.0±4.2	37.4±3.4	92.4±4.4	30.8±2.4	102.9±4.5	535.4±19.3
19	100.2±6.0	62.4±4.9	48.4±3.4	36.8±2.4	91.2±4.4	30.0±2.4	103.2±6.1	533.9±13.5
20	103.1±5.0	61.9±3.4	49.2±3.6	36.3±2.9	89.6±4.7	28.4±2.9	103.2±5.6	538.6±15.7
F =	8.1	9.6	4.3	6.2	23.1	8.2	18.0	8.0

Table 4. Matrix of Mahalanobis' D^2 (below diagonal) and the F-ratios (above diagonals) depicting the level of significance of the D^2 values.

	AH	DA	GD	GN	HA	HT	KA	KK	KR	KU	LA	ME	SA	SH	TE	TH	UN	VA	ZA	ZE
AH	–	8.50	5.56	3.21	6.30	5.60	2.57	20.90	5.09	12.34	4.80	13.65	7.56	6.55	3.24	4.18	6.33	4.53	5.83	12.52
DA	1.31	–	3.82	4.64	7.00	9.86	1.85	16.86	10.21	9.12	3.12	10.45	6.03	7.62	3.36	4.42	8.50	6.10	2.02	10.55
GD	1.57	1.23	–	2.77	5.89	2.64	2.91	6.35	5.74	11.50	5.56	8.69	2.98	6.12	5.09	4.11	5.81	6.42	4.46	6.19
GN	1.14	1.84	1.54	–	6.41	3.57	1.98	8.89	2.64	6.82	3.63	11.61	4.39	6.96	2.09	3.35	6.49	3.34	2.72	8.51
HA	1.97	2.48	2.99	3.80	–	5.72	3.93	16.94	6.55	8.75	5.79	2.35	3.16	2.84	4.79	4.89	2.13	6.36	5.49	0.85
HT	0.51	1.23	0.66	1.14	1.60	–	3.50	18.36	5.12	17.69	7.61	14.99	4.02	7.61	4.13	4.71	5.91	7.22	7.02	8.26
KA	0.88	0.71	1.58	1.25	2.28	1.08	–	11.39	2.78	2.75	0.68	5.15	2.91	4.29	2.02	1.28	4.28	2.97	0.75	5.05
KK	3.69	3.59	2.21	3.77	6.45	2.69	4.69	–	20.05	27.21	18.92	26.64	9.99	14.42	12.09	18.91	15.18	10.35	12.77	22.07
KR	0.50	1.35	1.48	0.87	1.89	0.36	0.88	3.09	–	12.47	5.77	17.18	5.32	9.09	2.38	5.20	5.74	3.93	4.81	11.39
KU	2.79	2.41	4.67	3.31	3.85	3.45	1.30	7.86	2.53	–	3.51	10.93	9.06	11.37	5.29	5.96	8.21	7.95	3.82	14.27
LA	1.05	0.80	2.21	1.73	2.50	1.43	0.32	5.32	1.13	1.18	–	8.81	6.23	6.79	2.75	2.19	7.36	5.20	2.01	9.07
ME	2.58	2.36	3.15	5.10	0.93	2.38	2.20	6.65	2.86	3.31	2.60	–	4.95	3.48	9.52	7.38	3.27	10.74	7.67	4.94
SA	1.97	1.81	1.35	2.32	1.52	0.92	1.50	3.25	1.26	3.46	2.33	1.68	–	3.40	5.22	4.52	3.66	5.63	3.76	3.26
SH	1.92	2.54	2.96	3.96	1.48	1.98	2.38	5.18	2.44	4.75	2.78	1.30	1.56	–	7.52	5.58	4.20	5.46	5.63	5.45
TE	1.06	1.24	2.48	1.28	2.69	1.21	1.21	4.78	0.72	2.41	1.23	3.91	2.60	4.04	–	3.19	5.20	2.98	2.79	6.90
TH	0.90	1.12	1.66	1.58	2.09	0.87	0.59	5.25	1.00	1.98	0.71	2.15	1.67	2.26	1.41	–	4.58	6.66	3.45	7.53
UN	2.01	3.05	2.98	3.89	1.17	1.68	2.51	5.85	1.68	4.11	3.21	1.31	1.78	2.21	2.95	1.98	–	5.94	6.02	3.58
VA	1.44	2.19	3.29	2.00	3.50	2.06	1.74	3.99	1.15	3.98	2.27	4.30	2.74	2.87	1.69	2.38	3.30	–	2.89	10.09
ZA	1.73	0.68	2.18	1.56	2.88	1.85	0.42	4.64	1.31	1.61	0.83	2.90	1.74	2.82	1.51	1.41	3.19	1.53	–	7.75
ZE	2.27	2.30	2.19	3.66	0.33	1.25	2.30	5.36	1.81	4.20	2.60	1.26	1.08	1.99	2.77	2.13	1.40	3.95	2.86	–

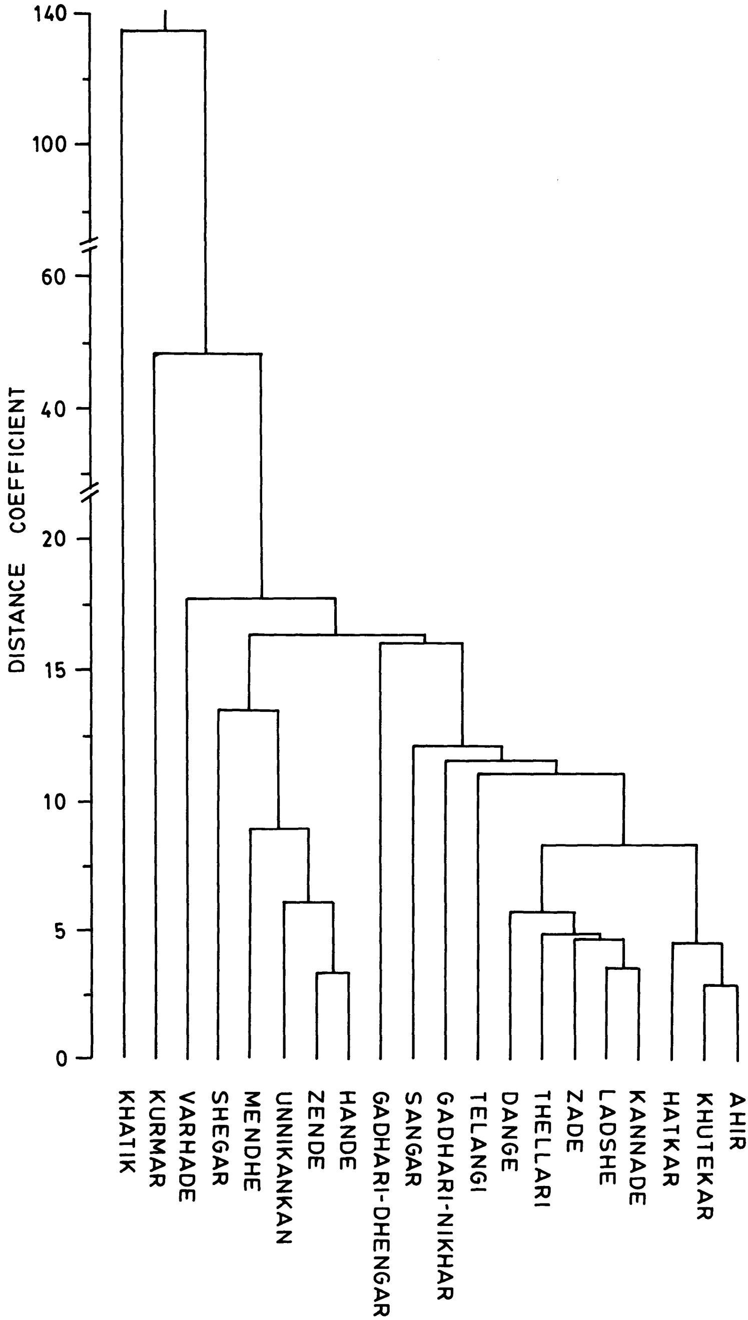

Fig. 2. Dendrogram of the 20 Dhangar castes based on the anthropometric distances.

14 anthropometric measurements. The D^2 values and the F-ratios for equality of mean vectors between different pairs of populations are presented in Table 4. Except the ones between Kannade and Dange, Ladshe and Kannade, Hande and Zende, Zade and Kannade, and Thellari and Kannade, all D^2 values are statistically significant ($p < 0.05$).

The D^2 matrix was subjected to single linkage cluster analysis and the resulting dendrogram (Fig. 2) portrays the following features of population affinities: The dendrogram can be characterized as having two major clusters, C_1 and C_2, with 12 and 8 populations, respectively. With few exceptions while the C_1 cluster comprises mostly of populations from North and North-Eastern Maharashtra, the C_2 is composed of populations from the South and Central Maharashtra. Within this major cluster C_1, there are two sub-clusters, C_{11} and C_{12}. While the former is formed by Ahirs, Khutekars and Hatkars, the three largest Dhangar groups, the other subcluster is formed by the Kannade, Ladshe, Zade, Thellari and Dange. While the geographically proximate Ahirs and Khutekars form a cluster at the first stage, the Hatkars join them as a third element to complete the subcluster C_{11}. Similarly, C_{12} is formed first by the geographically most proximate Ladshe and Kannade pairing up, to which the geographically contiguous Zade and Thellaris from North-Western Maharashtra and Dange from the South-Western Maharashtra join. To these two subclusters Telangis, Gadhari-Nikhar, Sangar, and Gadhari-Dhengar join as four independent elements and complete the main cluster C_1. Within the C_2 main cluster, the Hande, Zende, Unnikankan, Mendhe and Shegar, all from the south, form a compact cluster, connecting ultimately to the C_1 cluster in that order. Varhade and Kurmar from North-Eastern Maharashtra, and Khatiks from Southern Maharashtra join the overall cluster formed by the other 17 groups, as independent elements, in that order. These three groups stand out as somewhat more distinct in their antropometric profiles when compared to the rest of the groups.

Discussion

From the known ethnohistorical and linguistic backgrounds of the Dhangars, the following pattern of population relationships may be expected:

1. Hatkars, Zende, Thellari and Dange are supposed to have been from a single caste in the past and therefore may show very close affinity among them.
2. Linguistically Kurmars, Kannades and Unnikankans are Kannadigas and should reflect the same antropometric configuration.
3. Shegars claim that they have nothing to do with the Dhangars, and are descendants of Rajputs from Rajasthan, and therefore should stand out distinctly from other Dhangar castes.
4. Ahirs speak Ahrani, a mixed dialect of Gujarati and Marathi, and should show closer affinities with Ladshe and Dange who probably came from Gujarat.
5. Gadhari-Nikhar and Gadhari-Dhengar speak Hindi and had migrated from North India and thus they should show prominent differences with the other Dhangars, and
6. Khatiks seem to have derived from Khutekars and should show close similarity to them.

The foregoing analysis of the anthropometric variation among the Dhangars bears very little evidence supporting the above expectations, except that the two Gadhari groups, migrated from north, and the Telangis, who are originally from Andhra Pradesh, form as outer independent elements of C_1 cluster. The two Gadhari groups also are relatively closer to each other than to the other Dhangar castes. Additionally, the Dange and Thellaris who were supposed to be offshoots of Hatkars join cluster C_1 in which Hatkars are a component element, and Shegars who claim to have Rajaput origin from Rajasthan form only an outer independent element in the C_2, and the Kurmars who were originally from Karnataka stand out distinctly from the overall cluster formed by the 18 Dhangar castes, corroborating ethnohistorical backgrounds. Barring this ethnic semblance, the dendrogram based on anthropometric distances is largely in conformity to the geographical backgrounds. For example, the Ladshe, Kannade and Zade which have contiguous distributions in northeastern Maharashtra (Fig. 1) form a compact cluster within C_{11}, and Hande, Mendhe, Zende, Unnikankan, and Shegar from Southern Maharashtra with contiguous/overlapping distributions form close cluster within C_2. Although the Hatkars joining a cluster formed by the Ahirs and Khutekars seem somewhat not in conformity to the expected geographical pattern, it can be explained by the fact that while the focal areas of distribution in Fig. 1 are nonoverlapping, the numerical strengths of these three groups are very large (Table 1) and they have wide and substantially overlapping distributions, and hence the clustering pattern is not totally unexpected.

Overall, the linguistic backgrounds, especially those of non-Marathi groups are not, however, borne out by the anthropometric distance configuration of the Dhangars; for example the fact that the Unnikankans, Kurmars, and the Kannades were originally Kannada speakers is not reflected in the clustering pattern, nor the fact that the two Gadhari groups are Hindi speakers who migrated from the north. This might suggest that the anthropometric variables which are ecosensitive can not retain ethnohistorical characteristics, and instead reflect recent microevolutionary and environmental impacts on the populations. Similar observations were earlier made by several investigators (CHAI 1972, NEEL et al. 1974, FRIEDLAENDER 1975, RUDAN 1978, FROEHLICH & GILES 1981a, b; REDDY et al. 1987).

KARMAKAR (1990) recently compared dendrograms of the Dhangars based on different sets of biological variables, and it would be of interest here to recount her findings to get an overall picture of the biological affinities among them. She found that of the various sets of variables only palmar dermatoglyphic variables, both qualitative and quantitative, reflect ethnohistorical background to a certain extent, and this is conformatory to the observations of REDDY et al. (1988) and REDDY & REDDY (1992) and KARMAKAR et al. (1988). This is also similar to the pattern observed on the basis of genetic markers among the 14 Dhangar castes (MALHOTRA et al. 1978). However, the dendrogram based on finger dermatoglyphic distances show marked deviation from the ethnohistorical backgrounds of the groups. Using a method of hierarchical clustering of FOWLKES & MALLOWS (1983), KARMAKAR found that all the clusterings are mutually independent and there is no significant relationship between the dendrograms based on 5 different sets using binary division of the dendrograms, except between palmar triradii and palmar quantitative traits. Overall, it seems that the different sets of variables, probably with different genetic backgrounds, give different clustering patterns, with geographical backgrounds having overriding influence on the anthropometric variation.

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