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## Types and Combinations of Axial Triradii among the 20 Dhangar Castes of Maharashtra, India

Bilateral palmar prints of 3000 males belonging to 20 endogamous Dhangar castes of Maharashtra, India, have been analysed for types and combinations of axial triradii after Cummins and Midlo (1943). Altogether 17 types of axial triradii were found among the Dhangars, but only types *t*, *t'*, *tt'* occur in appreciable frequencies. The magnitude of intercaste differentiation in respect to axial triradii is considerably low; only 13 caste-pairs (6.84%) out of 190 pairs showed significant difference at the 5% level. Compared to several other palmar elements, like palmar true patterns, main line terminations, palmar flexion creases, the axial triradius has a considerably low level of differentiation among these nomadic, seminomadic and settled Dhangar castes. This suggests that the axial triradii are perhaps more stable compared to many other palmar elements. These results need to be confirmed by data from other populations.

### Introduction

Of the five triradii usually found on the human palm, the axial triradius *t*, has been found extremely useful in the diagnosis of a number of chromosomal disorders. Ever since CUMMINS in 1939 demonstrated the strong association between Down syndrome and axial triradii, numerous workers have not only confirmed Cummins's results but have also explored the association of this morphological trait with various genetic disorders (CUMMINS, 1939; HUNTER, 1968; BECKMAN *et al.*, 1962; PENROSE, 1963, 1969; PLATO *et al.*, 1973; SCHAUMANN & ALTER, 1976; WISNICWSK *et al.*, 1969). In contrast, although many investigators report regularly on its incidence in normal individuals, no systematic attempts have been made to examine the usefulness of axial triradii for inter-population studies. In fact, till recently its nature of distribution was even not known. MALHOTRA *et al.* (1981) showed that distribution of axial triradii is usually highly positively skewed and kpkurtic. The axial triradii present certain unique feature not showed by other palmar triradii, for example, they depict wide variation in the location on palm as well as in their number. This polymorphism, therefore, makes the trait potentially very useful for inter-population studies.

The purpose of this paper is to examine the nature and extent of variation in axial triradii among 20 Dhangar castes of the Western State of Maharashtra in India within the framework of inter-population studies.

### Materials and Methods

Bilateral inked palmar prints were obtained by standard ink method on specifically designed glazed papers from 3000 normal male individuals between 10 and 60 years of age. The data consist of 20 Dhangar castes and were collected from 177 villages spread

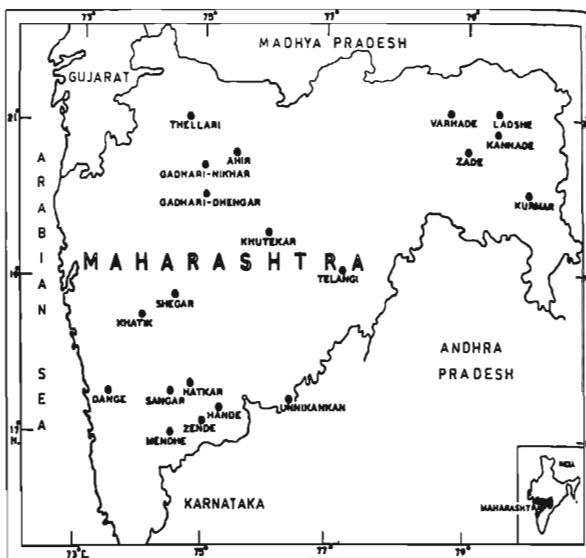


Figure 1 - Geographic location of 20 Dhangar castes in the state of Maharashtra, India, (after Malhotra 1979c).

over 82 Tehsils of all the 26 districts of Maharashtra. The data come from 20 Dhangar castes and were collected according to the random sampling design prepared by Drs. T.V. Hanurao and R. Chakraborty of the Indian Statistical Institute, Calcutta. The names and numbers of the 20 castes are shown in Table 1, and their geographic locations in Maharashtra are shown in Figure 1.

The Dhangar caste-cluster numbers over 3 million and comprises 21 endogamous castes. Some castes have been living in their present habitat for the last several centuries, while a few, such as Thellari and Kurmar, are recent immigrants. Some are settled, others are semi-nomads and a few continue to be true nomads. Although the word Dhangar refers to shepherds, these castes are engaged in a variety of professions: sheep rearing, buffalo rearing, woolen blanket weaving, cattle breeding, agriculturists, meat selling and cotton blanket weaving. At least four different languages are spoken by Dhangars: Marathi, Hindi, Kannada and Telugu. Further ethnographic and biological information on these castes are given in: MALHOTRA (1979a, 1979b). MALHOTRA & GADGI (1981). MUKHERJEE *et al.*, (1976) MALHOTRA *et al.* (1977, 1978).

The formulation of the axial triradii was done according to CUMMINGS & MINGO (1943): an axial triradius at or very near the proximal margin is formulated 1. The most

TABLE 1 - *Dermatoglyphic data by castes.*

Dhangar Castes	Abbreviation	Sample Size
1. Ahir	AH	289
2. Dange	DA	180
3. Gadhari-Dhangar	GD	103
4. Gadhari-Nikhar	GN	86
5. Hande	HA	86
6. Hatkar	HT	538
7. Kannade	KA	86
8. Khatik	KH	163
9. Khutekar	KT	432
10. Kurmar	KU	85
11. Ladshe	LA	105
12. Mendhe	ME	166
13. Sangar	SA	85
14. Shegar	SH	83
15. Telangi	TE	84
16. Thellari	TH	112
17. Unnikankan	UN	62
18. Varhade	VA	73
19. Zende	ZE	107
20. Zade	ZA	75
All Dhangar Castes		3,000

distally situated position of an axial triradius, near the center of the palm is  $t''$ , and one which lies at an intermediate position is  $t'$ . When two or more axial triradii occur they are formulated in proximo distal order (eg.  $t' t'' t'''$ ).

## Results

### Frequency Distribution

The frequencies of types and combinations of axial triradii among the Dhangars are presented in Table 2 and 3.

Altogether 17 types of axial triradii are observed among the Dhangars. However, only four types  $t$ ,  $t'$ ,  $tt'$  and  $tt''$  occur in appreciable frequencies.

The incidence on both palms of axial triradii types varies considerably among the Dhangar castes on both palms. Thus, on the right palm they range from 4 among the Ahir and the Khutekar. Also on the left palm the range is between 4 and 10 types. No significant differences between right or left palms were found among the castes in respect to the number of types.

In terms of each type of axial triradii also wide variations are also observed among the Dhangars for each type of axial triradii: on the right palm triradius  $t$  ranges from 61.63% among the Hande to 82.16% among the Hatkar;  $t'$  varies from 8.02% among the Mendhe to 23.29% among the Varhade;  $tt'$  has a range of 3.57% among the Thellari to 19.77% among the Hande. On the left palm triradius  $t$  varies from 61.17% among the Gadhari-Dhangar to 81.93% among the Mendhe;  $t'$  ranges from 8.24% among the Sangar to 27.42% among the Unnikankan;  $tt'$  ranges from 2.41% among the Mendheto to 15.12% among the Gadhari-Nikhar.

TABLE 2. Percent distribution of axial triad III among the Dhangar Castes.

Axial triad III	Ahir			Dange			Gadhari-Dhangar			Caghari-Nikhar		
	R	L	R+L	R	L	R+L	R	L	R+L	R	L	R+L
t	74.05	74.39	74.22	78.33	77.78	78.06	70.59	61.17	65.85	72.09	70.93	71.51
t'	15.92	13.84	14.88	12.78	15.00	13.89	15.69	21.36	18.54	18.60	12.79	15.70
t''	1.38	1.04	1.21	0.56		0.28		0.97	0.49	1.16		0.58
t'''							0.98	1.94	1.46			
tt	0.69		0.35	0.56		0.28				1.16		0.58
tt'	4.15	9.00	6.57	5.00	4.44	4.72	7.84	8.74	8.29	4.65	15.12	9.88
tt''	2.42	0.35	1.38	1.11	1.11	1.11	1.96	0.97	1.46	2.33	1.16	1.74
tt'''	0.35	0.35	0.35	1.11	1.11	1.11	1.96	1.94	1.95			
t't	0.35		0.17									
t't'	0.35	0.35	0.35		0.56	0.28	0.98	0.97	0.98			
t't''										0.97	0.49	
t't'''												
t't't	0.35		0.17									
ttt'												
tt't''										0.97	0.49	







TABLE 3 - Percent distribution of axial triradii in the pooled Dhangar Series.

Axial triradii	R		L		R+L	
	f	%	f	%	f	%
t	2229	74.42	2221	74.03	4450	74.23
t'	393	13.12	414	13.80	807	13.46
t''	42	1.40	29	0.97	71	1.18
t'''	4	0.13	8	0.27	12	0.20
tt	7	0.23	4	0.13	11	0.18
tt'	214	7.15	229	7.63	443	7.39
tt''	71	2.37	65	2.17	136	2.27
tt'''	13	0.43	10	0.33	23	0.38
t't'	4	0.13	1	0.03	5	0.08
t't''	5	0.17	5	0.17	10	0.17
t't'''	1	0.03	1	0.03	2	0.03
tt't'	1	0.03	1	0.03	2	0.03
tt't''	10	0.33	11	0.37	21	0.35
t't't''	1	0.03			1	0.02
t''t''						
ttt'						
tt't'''			1	0.03	1	0.02

When both palms are considered together, it is observed that the axial triradii vary from 5 among three castes to 11 among the Ahir.

Similar trends, as expected, are found in the pooled Dhangar series. For type *t*, the highest frequency is 74.42% for the right, 74.03% for the left and 74.23% for right plus left palm. Type *t'* comes second with 13.12% for the right, 13.8 for the left and 13.46% for right and left. The third position is held by type *tt'* with 7.15% for the right, 7.63% for the left and 7.39 for right and left.

#### Inter caste Comparisons

As noted earlier, although altogether 17 different types of axial triradii have been observed among the Dhangar castes, only three types *t*, *t'* *tt'* occur in appreciable frequencies. Therefore, the remaining types were pooled in the «rest» category. The intergroup chi-square values for three degrees of freedom among the Dhangar castes are given in Table 4. It is noteworthy that the 20 Dhangar castes show a great deal of homogeneity in respect to axial triradii. Only 13 caste-pairs (6.84%) out of 190 showed significant differences at the 5% and below levels. Two castes, namely, Haude and Hunnikankan contribute a great deal to the significant pairs.



TABLE 4 - Chi-square values based on percent frequencies for intergroup differences with respect to axial triadness (d.l.3).

Dhangar Castes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Ahir	—	0.57	1.85	1.01	5.92	1.95	1.08	2.44	0.20	0.49	0.90	4.26	9.48*	0.30	1.45	1.20	3.71	1.25	0.35	0.56
2. Dange	—	4.15	2.22	8.97*	1.86	3.14	4.50	1.32	1.93	1.87	3.60	2.46	0.26	2.63	2.29	5.41	3.14	0.36	0.67	
3. Gadhari-Dhengar	—	2.54	4.76	5.80	0.57	2.62	0.99	1.00	3.17	7.43	7.28	2.61	2.57	1.07	1.37	0.99	3.29	3.87		
4. Gadhari-Nibhar	—	4.92	3.56	1.03	0.47	1.27	1.22	0.65	8.33*	2.87	2.09	2.91	2.36	5.91	0.58	0.91	0.72			
5. Hande	—	5.46	2.92	4.44	4.63	3.32	3.43	9.00*	5.78	8.37*	2.83	8.76*	10.44*	5.04	7.81*	6.60				
6. Haskar	—	3.71	5.96	2.26	2.13	1.37	1.99	0.61	2.54	1.07	5.86	9.23*	5.22	2.42	1.74					
7. Kennade	—	1.22	0.52	0.28	1.20	6.71	4.35	2.23	1.49	1.72	3.41	0.49	2.14	2.15						
8. Kharik	—	2.39	2.11	1.71	11.54*	5.00	3.97	4.36	3.15	6.43	0.55	2.35	2.33							
9. Khutekar	—	0.12	1.06	4.18	3.30	0.72	0.95	1.13	2.93	1.07	1.03	1.24								
10. Kurmar	—	0.79	4.40	3.04	1.34	0.62	1.77	3.61	1.08	1.48	1.45									
11. Ladhe	—	5.38	1.09	2.07	1.24	3.59	7.17	1.73	1.18	0.59										
12. Mendhe	—	4.54	3.83	2.43	7.45	8.60*	9.17*	5.52	5.46											
13. Saagar	—	3.61	2.36	7.11	11.82*	5.26	2.41	1.37												
14. Shgar	—	2.37	1.10	3.36	2.24	0.50	1.07													
15. Telangi	—	3.96	5.67	3.25	2.77	2.37														
16. Thalhari	—	1.11	1.17	7.78	2.81															
17. Unnikankan	—	3.39	5.20	6.73																
18. Varbade	—	1.73	1.99																	
19. Zende	—	1.99																		
20. Zade	—																			

\* Significant at 5% and below levels.

TABLE 5 - Significant caste-pairs in respect of some palmar variables among the Dhangars.

Variables	d.f.	No. of pairs out of 190 caste-pairs
Palmar crease	2	136 (71.58%)
Finger patterns	3	112 (58.94%)
Main Line Termination	3	49 (25.78%)
Palmar pattern	1	166 (17.4 %)
Axial triradii	3	13 ( 6.84%)

### Discussion

From the foregoing analysis it is seen that altogether 17 different types of axial triradii are observed among the Dhangars. Only four types *t*, *t'*, *tt'* and *tt''*, however, occur in appreciable frequencies. The frequency of the four axial triradii in decreasing order of magnitude are *t*, *t'*, *tt'* and *tt''*. These results are in agreement with the findings of numerous earlier workers (see among others CUMMINS & MIDLO 1943; TIWARI 1955; CHAKRAVARTTI, 1959,1960; SHARMA 1962; BHASIN 1964, 1969; BHATTACHARYA 1964; DAS, 1966; BANSAL 1967; SARKAR *et al.* 1969; MALHOTRA *et al.* 1981).

In earlier papers we reported on the variation of other palmar elements among the Dhangar castes. It is of considerable interest that compared to all the other palmar elements examined so far, i.e. palmar patterns (KARMAKAR & MALHOTRA, 1986a), main line terminations (KARMAKAR & MALHOTRA, 1986b, palmar flexion creases (KARMAKAR & MALHOTRA, 1986c) and finger patterns (MALHOTRA, 1979), the axial triradii among the Dhangar castes show the least inter-caste differentiation (Table 5). It appears, therefore, that compared to certain other palmar elements, at least the ones mentioned above, the axial triradius appears to be more stable. This conclusion, however, needs further confirmation studies.

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