J. Hum. Ecol., 9(5): 485-488 (1998)

Quantification of Interpopulation Variations Based on Somatometric Measurements in four Endogamous Scheduled Caste Populations of Kahalgaon, Bihar

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KEY WORDS Somatometry. Scheduled Castes. East India. Variation.

ABSTRACT Range and mean values of eight somatometric measurements pertaining to body lengths, head-size etc. were studied by survey method in representative random samples of four endogamous scheduled caste populations (Gorhi, Dusadh, Chamar and Mushar) of Kahalgaon region of Bhagalpur, Bihar (India). The males have significantly higher proportions of body than their females. Positive correlations (most of which were significant) exist between the various parameters within any population. Mahalnobis D^2-statistic could show that all the populations are significantly different from one another. However, three of them *viz*; Gorhi, Chamar and Mushar seem to form one cluster while Dusadh falls sufficiently apart from any one of the three.

INTRODUCTION

Among the scheduled castes, inhabiting the south eastern region of the Bihar State, the most predominant ones are Gorhi (engaged in fishing), Dusadh (village watch-man), Chamar (hide processor) and Mushar (earth diggers). Members of each of these castes live separately in their small settlements on the fringe of villages, and practice endogamy. Sufficient literature is available about the socio-economic conditions, numerical strength (census data) etc. of these castes, but very little is known as to their anthropometric profile (Dash-Sharma and Haque, 1975; Dash-Sharma, 1978; Singh and Sinha, 1988; Pandey et al., 1994). The present work was, therefore, undertaken (i) to record some of their somatometric measurements, and then (ii) to calculate the correlation of form of various parts of their body; at the end, (iii) an attempt was made to estimate the anthropometric difference between the pairs of populations by taking all the parameters together.

SUBJECTS AND METHODS

The data were collected by door-to-door survey method from the populations living in 28 randomly sorted out villages in the Kahalgaon Block of Bhagalpur District (Bihar). The sample so selected represented roughly 20 per cent of the respective total population of each caste in the locality. Full grown up adults (number of male subjects was more than that of the females for obvious reasons) of age between 25 to 45 years were subjected to various measurements. Only one person was selected per family (preferably the first born). Sick or physically handicapped persons were discarded.

Eight somatometric measurements (three related to the arc of head, and the remaining related to the body height in standing position) were taken using standard procedures recommended therefor (Singh and Bhasin, 1989) namely - 1) Arc of the Head (AH), 2) Sagittal or Longitudinal Arc of the Head (SA), 3) Bi-tragion-Submandibular Arc (BTSA), 4) Span of the Body (SP), 5) Height Vertex (Stature, HV), 6) Head-Omphalion Length (HA), 7) Height-Omphalion (HO) and 8) Total Arm Length (TAL).

RESULTS AND DISCUSSION

The range and mean values of each of the eight measurements in the four populations have been put in table 1. Quite expectedly, the mean values of measurements in females are significantly lower than those in their males. For each of the eight parameters, the Chi-square values between most of the pairs of populations indicate significant difference among them (Table 2). The measurements only among the males were considered in this study.

Correlation Matrix (r): A correlation matrix was calculated between pairs of characters within each population. Among the Gorhis, this correlation was significantly positive for all the

difference is statistically significant while sex dimorphism is observed for the right hand only. Thus the present population deviates from other neighbouring tribal groups *viz*., the Bagatha (Heena and Narahari, 1990), Konda Dora (Narahari et al., 1989), Mali (Narahari et al., 1995) since sex dimorphism (Cummins and Midlo, 1961; Holt, 1968; Mukherjee, 1967). However, Henry's classification of pattern types reveals significant sex dimorphism suggesting the prominence of pattern variability details (Bhanu, 1991).

(b) Finger Pattern Intensity Index (FPII): It's mean value is though slightly higher for the males but fail to exhibit significant sex dimorphism. This may be due to an excess of tented arches in females despite more whorls observed in females.

(c) Ridge Counts: Total and Absolute Finger Ridge Counts (TFRC and AFRC) are relatively smaller compared to other neighbouring populations reported so far. Hence, an attempt is made to evaluate the role of elevated position of pattern triradius and size of the pattern. To ascertain this a conventional method was followed in the present study by taking the ridge count between the basal phalangeal crease and triradial point which in turn is correlated with concern pattern ridge count. The correlation coefficient values along with the 't' values for sex difference were given in table 2. Interestingly there is a positive correlation between the two varied riding counts. The values are slightly higher for females than males. Except the III digit (in males only) all the digits show r value more than 0.5. The sex differences are significant for the I, III digits only. Such a correlation may be assumed in view of Loesch's (1971) schematic embryonic formation of dermal ridges during 13th week of embryo.

Palmar Dermatoglyphics

(a) Principal Main Line Formulae (PMLF): 7.5.5- predominates followed by 9.7.5- and 11.9.7.-. In laterality, right hand than the left hand revelas high values. The sex difference is statistically significant. The Nooka Doras by having high frequency of 7.5.5.- deviates from the Bagatha, Koya Dora and Valmiki in whom 11.9.7.- predominates.

(b) Polymorphic C-Line: 'Ulnar' type of termination occurred most frequently followed by 'Radial' type. Right hand shows much variability than the left in both the sexes. Again females are considerably varying than males. However, neither bilateral nor sex dimorphism is statistically significant among the Nooka Doras.

(c) Hypothenar Triradii: Females show about 2 per cent excess of hypothenar triadius (H^p) while males show almost double the frequency of extra limital tririadius (H^{Ex}) over their counterparts. The bimanual; and sex differences are non-significant. This corroborates with the earlier findings by Kamali et al. (1986) for Monogoloid and Caucasoid but deviates from those of Karmakar and Malhotra (1982) and Narahari (1982).

(d) Main Line Index (MLI): The mean values of the character were observed slightly higher for males. Right hand shows much transversality

Table 2: Correlation coefficients (r) between X and Y ridge counts

Digit	*Male (145)*			*Female (140)*			*'t' values for Sex Difference*
	Max. X	*Count Y*	*R ± S.E.*	*Max. X*	*Count Y*	*R ± S.E.*	
Right Hand							
I	48	31	0.54 ± 0.04	38	42	0.67 ± 0.03	2.72*
II	30	25	0.67 ± 0.03	35	24	0.63 ± 0.03	0.72
III	27	26	0.47 ± 0.04	33	27	0.61 ± 0.04	2.43*
IV	39	25	0.63 ± 0.03	37	26	0.65 ± 0.03	0.05
V	29	24	0.50 ± 0.04	38	24	0.60 ± 0.04	1.61
Left Hand							
I	42	33	0.57 ± 0.04	35	30	0.65 ± 0.03	1.56
II	44	26	0.59 ± 0.04	29	26	0.56 ± 0.04	0.63
III	32	32	0.32 ± 0.05	30	31	0.57 ± 0.04	-3.95*
IV	38	33	0.59 ± 0.04	33	32	0.52 ± 0.05	0.95
V	29	25	0.55 ± 0.04	29	22	0.54 ± 0.04	0.28

*Significant at 5% probability level

Note : X = Digital ridge count

Y = Ridge count from triradial point to the basal phalangeal crease in a digit

Table 3: Correlation matrix (r) between measures of pairs of characters among tne Gorhi scheduled caste (tne upper triangle contains correlation values (all values of r are in positive), and the lower triangle indicates the corresponding t-values)

Traits	*AH*	*SA*	*BTSA*	*SP*	*HV*	*HAL*	*HO*	*TAL*
AH	-	0.771	0.481	0.825	0.782	0.683	0.607	0.801
SA	16.751[1]	-	0.489	0.767	0.726	0.607	0.603	0.755
BTSA	07.574[1]	7.745[1]	-	0.449	0.457	0.416	0.349	0.482
SP	20.175[1]	16.519[1]	6.952[1]	-	0.942	0.864	0.680	0.959
HV	17.336[1]	14.610[1]	7.102[1]	38.834[1]	-	0.873	0.683	0.924
HAL	12.924[1]	10.558[1]	6.325[1]	23.695[1]	24.762[1]	-	0.307	0.858
HO	10.552[1]	10.444[1]	5.142[1]	12.829[1]	12.925[1]	4.452[1]	-	0.643
TAL	18.498[1]	15.909[1]	7.602[1]	46.977[1]	33.283[1]	23.120[1]	11.589[1]	-

1-indicates positive significant correlation.

Table 4: Correlation matrix (r) between measures of pairs of characters among the Dusadh scheduled caste (the upper triabgle contains correlation values (all values of r are in positive, and the lower triangle indicates corresponding t-values)

Traits	*AH*	*SA*	*BTSA*	*SP*	*HV*	*HAL*	*HO*	*TAL*
AH	-	0.736	0.597	0.536	0.496	0.497	0.156	0.534
SA	15.775[1]	-	0.633	0 511	0.471	0.466	0.162	0.468
BTSA	10.821[1]	11.871[1]	-	0.651	0.621	0.550	0.299	0.552
SP	09.216[1]	8.639[1]	12.471[1]	-	0.941	0.787	0.527	0.868
HV	08.288[1]	7.758[1]	11.523[1]	40.262[1]	-	0.823	0.576	0.822
HAL	08.312[1]	7.643[1]	9.575[1]	18.528[1]	21.014[1]	-	0.014	0.700
HO	02.289[1]	2.383[1]	4.544[1]	9.017[1]	10.248[1]	0.203	-	0.448
TAL	09.184[1]	7.702[1]	9.614[1]	25.402[1]	20.969[1]	14.223[1]	7.281[1]	-

1-indicates positive significant correlation

Table 5: Correlation matrix (r) between measures of pairs of characters among the Chamar scheduled caste (the upper triangle contains correlation values (values of r are in positive), and the lower triangle indicates the corresponding t-values)

Traits	*AH*	*SA*	*BTSA*	*SP*	*HV*	*HAL*	*HO*	*TAL*
AH	-	0.921	0.847	0.894	0.864	0.720	0.683	0.837
SA	24.770[1]	-	0.861	0.837	0.792	0.607	0.709	0.813
BTSA	16.721[1]	17.729[1]	-	0.871	0.842	0.698	0.670	0.845
SP	20.940[1]	16.036[1]	18.584[1]	-	0.972	0.837	0.723	0.931
HV	17.988[1]	13.602[1]	16.360[1]	43.300[1]	-	0.894	0.693	0.898
HAL	10.873[1]	8.013[1]	10.231[1]	16.061[1]	20.891[1]	-	0.296	0.754
HO	09.808[1]	10.534[1]	9.456[1]	10.991[1]	10.084[1]	3.252[1]	-	0.700
TAL	16.013[1]	14.639[1]	16.539[1]	26.816	21.417[1]	12.042[1]	10.293[1]	-

Table 6: Correlation matrix (r) between measures of pairs of characters among the Mushar scheduled caste (the upper triangle contains correlation values (all values of r are in positive), and the lower triangle indicates the corresponding t-values)

Traits	*AH*	*SA*	*BTSA*	*SP*	*HV*	*HAL*	*HO*	*TAL*
AH	-	0.813	0.792	0.840	0.814	0.758	0.463	0.829
SA	15.554[1]	-	0.824	0.823	0.803	0.725	0.504	0.791
BTSA	14.451[1]	16.212[1]	-	0.772	0.759	0.671	0.507	0.762
SP	17.236[1]	16.126[1]	13.524[1]	-	0.976	0.883	0.607	0.957
HV	15.630[1]	14.998[1]	12.991[1]	49.970[1]	-	0.917	0.598	0.937
HAL	12.951[1]	11.737[1]	10.076[1]	20.994[1]	25.668[1]	-	0.230	0.869
HO	05.820[1]	6.496[1]	6.554[1]	8.499[1]	8.299[1]	2.628[1]	-	0.539
TAL	16.477[1]	14.380[1]	13.096[1]	36.915[1]	29.903[1]	19.579[1]	7.129[1]	-

the correlation matrix-values in each of the four populations, it is difficult to quantify the degree of similarity or variability among them (populations). In order to overcome this hurdle,

Mahalnobis D^2-statistic (Sanghvi, 1953) was applied to know the somatometric difference between the pairs of populations by considering all the parameters together. It was found that such D^2-value (Table 7) for each pair of populations is significant either at 0.01 or 0.001 levels of significance. The Dusadh population seems to be more markedly distant from the remaining three populations, which in spite of their respective differences from each other, form a sort of cluster. This relationship can be diagrammatically represented as in figure 1. The conglomeration of Chamar, Mushar and Gorhi in one group indicates their identical anthrometric make-up.

Table 7: The D^2-values between pairs of populations on the basis of somatometric measurements (Upper triangle indicates D^2-values, and the lower triangle indicates corresponding degrees of freedom

Populations	*Gorhi*	*Dusadh*	*Chamar*	*Mushar*
Gorhi	-	30.79^2	05.85^1	09.13^1
Dusadh	08.40	-	33.63^2	54.51^2
Chamar	08.30	08.32	-	12.88^2
Mushar	08.31	08.33	08.23	-

1 and 2 indicate significant values at P equal to 0.01 and 0.001, respectively

The Dusadh population is sympatric with the remaining three in the sense that they co-habit in the same locality. Its greater D^2-value speaks of some inherent genetic peculiarity in it that makes it distinctly different from the remaining three scheduled caste populations.

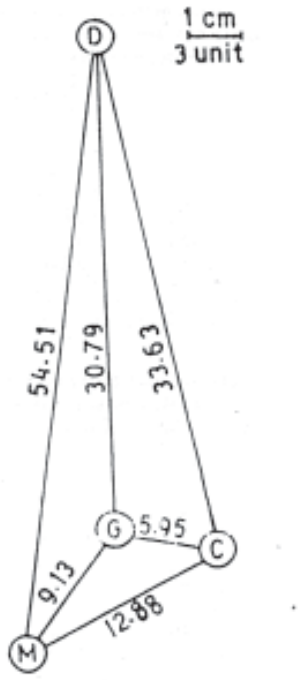

Fig. 1. A diagrammatic representation of interpopulation D^2-value based on anthropometric measures. G-Gorhi, D-Dusadh, C-Chamar, M-Mushar

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