

A Study of Numerical Taxonomy and Group Divergence in Seven Endogamous Groups of Assam

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ABSTRACT Anthropometric characters of seven endogamous groups, namely, the Muslim, Brahmin, Kalita, Kaibarta, Kumar, Jogi and Hira of Assam have been examined to study the numerical taxonomy and group divergence using the methodology of Penrose (1947, 1954) and Rao (1952). The study reveals three distinct clusters. Out of seven groups, the Brahmin and Muslim independently form two clusters i.e. B and C respectively, whereas the rest i.e. the non-Brahmin Hindus namely the Hira, Kaibarta, Jogi Kumar and Kalita together form another cluster (i.e. A). Both the Brahmin and Muslim maintain considerable distance from the non-Brahmin Hindu groups. However, it appears that the distance between the Brahmin and the non-Brahmin Hindu groups is much shorter (distance between B and A is 0.8899), than that between the Muslim and the non-Brahmin groups (distance between C and A is 1.0620). This finding more or less agrees with the known ethnic history of the endogamous groups included in the present study.

INTRODUCTION

Multivariate distance analysis is helpful to overcome the difficulty of assessing the inter-group relationships which is based on univariate analysis. To classify the population groups it is necessary to find out the morphological affinities and differences between and among the groups. Therefore, in estimating the numerical taxonomy and group divergence of some particular groups it is needed to perform the analysis of overall distance differences and mutual relationships among all possible pairs from a matrix of all multivariate distances between the groups obtained by utilising a suitable measure of taxonomic distance.

In our earlier study (Adak and Das, 1994)

we have highlighted the numerical taxonomy and group divergence among five Mongoloid populations of Assam which was based on anthropometric data. In the present study we have made an attempt to study the same among seven endogamous groups of Assam which is also based on anthropometric data (Das et al., 1985, 1986).

MATERIAL AND METHODS

The present investigation is based on 12 anthropometric characters (i.e. stature, sitting height, head length, head breadth, bizygomatic breadth, head height, nasal height, nasal breadth, total facial height, upper facial height, circumference of head and girth of thorax of the Muslim, Brahmin, Kalita, Kumar, Kaibarta, Jogi and Hira of Assam published by Das et al. (1985, 1986).

The 'size' and 'shape' distances have been calculated following the measures of Penrose (1947, 1954). Common standard deviations for each character have been used, to estimate the distance. The combined means are expressed in terms of pooled standard deviation unit. To see the intra-and inter-cluster average among the seven groups the values of " D^2_p " have been analysed following the method of Rao (1952).

The studied seven endogamous groups are "Caucasoid in origin. All these groups belong to Assamese Hindu castes, except the Muslim. So far as these castes are concerned, in the caste hierarchy, the Brahmin occupy the highest position. The Kaibarta and Hira are recognised as Scheduled Caste and the Jogi and Kumar belong to Backward Caste of As-

sam. The Kalita form the most populous caste of Assam. In the caste hierarchy their position is next to the Brahmin. In this connection it may be mentioned that caste system among the Assamese Hindus is not rigid to that found in some other parts of India. However, caste endogamy exists in general and thereby biological isolation is maintained, by each caste (Das et al., 1987).

RESULTS AND DISCUSSION

Table 1 sets out the mean and standard deviations of 12 anthropometric characters of seven endogamous groups. Table 2 shows the means in terms of pooled standard deviation unit. In table 3 the differences between measurements and derived distances between any two groups have been shown. The results have been presented in tables 4-6.

For an overall view about the size and shape factors the mean size and shape distances have been calculated by MC^2_Q and $(m-1)C^2_z$ for each comparison (21 in number). The computed mean value for size distance between 21 pairs is 0.23 and for shape distance is 0.59. It indicates that the value of shape distance is larger than size distance. So, it can be said that the seven endogamous groups show a tendency to differ more in shape distance than in size distance. Therefore, here the shape distance plays more important role than size distance because of overall morphological dissimilarity and differences.

Table 6 shows the values of D^2_p on all 21 pairs in an increasing order of magnitude. It shows that the Hira is closely related with the Kaibarta (*i.e.* 0.12) and Kumar (*i.e.* 0.48) and the Jogi with the kaibarta (*i.e.* 0.48) and Hira (*i.e.* 0.48). But the Brahmin and Muslim both maintain a distant relation with rest of the groups (*i.e.* the Jogi, Hira, Kalita, Kaibarta and Kumar). However, it appears that the Brahmin are more distantly related to the Muslim (*i.e.* 1.56) than to the other Hindu

castes.

Table 7 exhibits the D^2_p values which are obtained in accordance with the method of Rao (1952). This has been done to see the position of intra and inter-cluster average among the seven groups. To draw a clear view of the situation figure 1 seems to be useful for the approximate configuration. The mutual relationships of D^2_p values represent the distances where the square root of average D^2_p 's are used.

Table 8 shows the changes in average D^2_p which is based on the result of table 6. It appears that the Brahmin and Muslim are forming two cluster separately (*i.e.* B and C) while the other five endogamous groups are combinedly forming another cluster (*i.e.* A). However, the three clusters are maintaining a considerable distance, though the distance between A and B is less than that between A and C as well as between B and C.

CONCLUSION

Numerical taxonomy, group divergence and the inter-group relationships of seven endogamous groups of Assam reflect that the Brahmin and Muslim are placed in separate clusters and the rest *i.e.* the non-Brahmin Hindus namely the Hira, Kaibarta, Jogi Kumar and Kalita together form a separate cluster. These three clusters maintain a considerable distance from each other.

It appears that both the Brahmin and Muslim maintain a considerable distance from the non-Brahmin Hindu groups. But the distance of the Brahmin from the non-Brahmin Hindus is comparatively shorter (distance between B and A is 0.8899) than that from the Muslim (distance between C and A is 1.0620).

It may be mentioned that among the six Assamese Hindu castes studied, the Brahmins are the priestly caste and occupy the topmost position in caste hierarchy, while the Muslims are culturally different from these

Table 1 : Means and standard deviation (S.D.) of anthropometric characters of the seven populations (after Das et al., 1985, 1986)

Measurements (in cm.)	Muslim (n=51)		Brahmin (n=52)		Kalita (n=50)		Kaibarta (n=257)		Kumar (n=100)		Jogi (n=269)		Hira (n=199)	
(m=12)	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1. Stature (St.)	161.91	5.21	163.73	5.19	165.04	5.30	163.10	10.26	163.06	5.50	164.29	5.41	161.46	5.56
2. Sitting height (S.H.)	82.74	3.43	84.18	3.03	83.49	3.96	82.96	7.69	81.95	3.30	83.86	2.79	82.95	3.49
3. Head length (H.L.)	18.28	0.50	18.25	0.50	18.22	0.49	18.29	1.12	18.24	0.60	18.21	2.62	18.26	0.55
4. Head breadth (H.B.)	14.04	0.43	14.33	0.50	14.35	0.35	14.52	1.12	14.39	0.40	14.44	0.49	14.46	0.87
5. Bizygomatic breadth (B.B.)	12.98	0.36	13.15	0.50	13.13	0.28	13.16	0.96	13.03	0.40	13.32	0.33	13.20	0.55
6. Head height (H.H.)	13.11	1.07	13.11	1.08	13.22	1.06	13.15	2.73	13.53	1.20	13.41	1.15	13.32	0.98
7. Nasal height (N.H.)	4.65	0.36	5.01	0.29	4.79	0.35	4.65	0.80	4.92	0.50	4.74	0.33	4.72	0.33
8. Nasal breadth (N.B.)	3.47	0.21	3.49	0.22	3.41	0.14	3.52	0.64	3.48	0.30	3.59	0.33	3.48	0.22
9. Total facial height (T.F.H.)	11.12	0.43	11.18	0.43	11.36	0.64	11.10	1.28	11.28	0.70	11.39	0.49	11.20	0.55
10. Upper facial height (U.F.H.)	6.34	0.43	6.38	0.36	6.47	0.42	6.30	0.96	6.58	0.50	6.45	0.49	6.45	0.44
11. Circumference of head (C.H.)	54.49	1.36	55.10	1.15	54.00	1.06	54.52	2.56	54.38	1.30	54.81	1.31	54.59	1.53
12. Girth of thorax (G.T.)	79.65	3.43	83.45	3.24	81.29	3.32	83.17	8.34	83.75	3.60	83.44	3.77	83.53	4.58

Table 2 : Means of anthropometric characters of seven population groups in terms of pooled standard deviation unit

Population	St.	S.H.	H.L.	H.B.	B.B.	H.H.	N.H.	N.B.	T.F.H.	U.F.H.	C.H.	G.T.
Muslim	22.64	26.95	11.50	18.47	20.94	7.53	8.77	8.26	13.56	9.75	30.78	14.46
Brahmin	22.90	27.42	11.48	18.86	21.21	7.53	9.45	8.31	13.63	9.82	31.13	15.15
Kalita	23.08	27.20	11.46	18.88	21.18	7.60	9.04	8.12	13.85	9.95	30.51	14.75
Kaibarta	22.81	27.02	11.50	19.11	21.23	7.56	8.77	8.38	13.54	9.69	30.80	15.09
Kumar	22.81	26.69	11.47	18.93	21.02	7.78	9.28	8.29	13.76	10.12	30.72	15.20
Jogi	22.98	27.32	11.45	19.00	21.48	7.71	8.94	8.55	13.89	9.92	30.97	15.14
Hira	22.58	27.02	11.48	19.03	21.29	7.66	8.91	8.29	13.66	9.92	30.84	15.16
Pooled S.D.	7.15	3.07	1.59	0.76	0.62	1.74	0.53	0.42	0.82	0.65	1.77	5.51

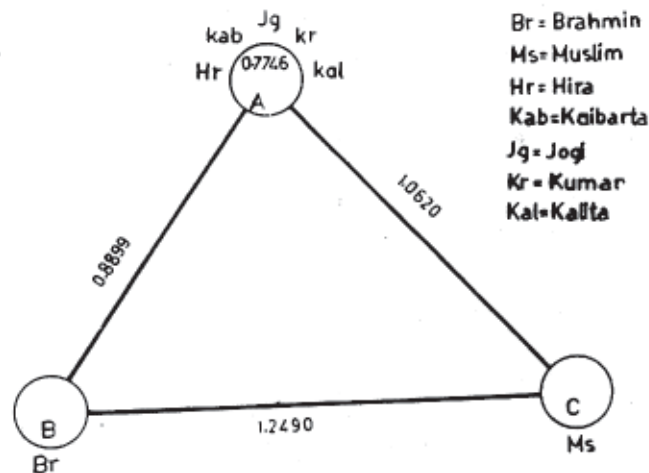
**Fig. 1. Clusters and their inter-relationships**

Table 4 : Values of size distance (mC_Q^2) between any two populations

Populations	Muslim	Brahmin	Kalita	Kaibarta	Kumar	Jogi	Hira
Muslim	-	0.84	0.36	0.24	0.48	1.20	0.48
Brahmin	-	-	0.12	0.12	0.00	0.00	0.12
Kalita	-	-	-	0.00	0.00	0.24	0.00
Kaibarta	-	-	-	-	0.00	0.24	0.00
Kumar	-	-	-	-	-	0.12	0.00
Jogi	-	-	-	-	-	-	0.24
Hira	-	-	-	-	-	-	-

Table 5 : Values of shape distance $(m-1) C_Z^2$ between any two populations

Populations	Muslim	Brahmin	Kalita	Kaibarta	Kumar	Jogi	Hira
Muslim	-	0.72	0.48	0.72	0.84	0.36	0.48
Brahmin	-	-	0.72	0.72	0.96	0.60	0.60
Kalita	-	-	-	0.60	0.72	0.48	0.72
Kaibarta	-	-	-	-	0.72	0.24	0.12
Kumar	-	-	-	-	-	0.84	0.48
Jogi	-	-	-	-	-	-	0.24
Hira	-	-	-	-	-	-	-

Table 6 : Values of D_p^2 (based on 12 characters) between any two populations arranged in increasing order of magnitude

Muslim	Brahmin	Kalita	Kaibarta	Kumar	Jogi	Hira
0.84	0.60	0.60	0.12	0.48	0.48	0.12
Kalita	Jogi	Kaibarta	Hira	Hira	Kaibarta	Kaibarta
0.96	0.72	0.72	0.48	0.72	0.48	0.48
Kaibarta	Hira	Kumar	Jogi	Kalita	Hira	Kumar
0.96	0.84	0.72	0.60	0.72	0.60	0.48
Hira	Kalita	Jogi	Kalita	Kaibarta	Brahmin	Jogi
1.32	0.84	0.72	0.72	0.96	0.72	0.72
Kumar	Kaibarta	Hira	Kumar	Brahmin	Kalita	Brahmin
1.56	0.96	0.84	0.84	0.96	0.96	0.72
Brahmin	Kumar	Muslim	Brahmin	Jogi	Kumar	Kalita
1.56	1.56	0.84	0.96	1.32	1.56	0.96
Jogi	Muslim	Brahmin	Muslim	Muslim	Muslim	Muslim

Table 7 : Intra- and inter-cluster average D_p^2

Cluster	Population	A	B	C
A	Hira, Kalita, Kaibarta	0.6000	0.7920	1.1280
B	Kumar, Jogi	0.7920	-	1.5600
C	Brahmin	1.1280	1.5600	-

Table 8 : Computational scheme for finding cluster

Population added to cluster	D_p^2	No. of terms (n)	Increasing in D_p^2 Increasing in n	Average D_p^2	Cluster
Hira, Kaibarta	0.12	1	-	0.12	Hira, Kaibarta
Jogi	1.08	3	0.48	0.36	Hira, Kaibarta, Jogi
Kumar	3.24	6	0.72	0.54	Hira, Kaibarta, Jogi, Kumar
Kalita	6.00	10	0.69	0.60	Hira, Kaibarta, Jogi, Kumar, Kalita (A)
Brahmin	9.96	15	0.79	0.66	-
Brahmin, Muslim	1.56	1	-	1.56	Brahmin (B)
Muslim	-	-	-	-	Muslim (C)

six groups. Thus, the ethnographic background of the populations studied provides interesting corroboration of anthropometric data and their inter-group relationships.

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REFERENCES

- Adak, D.K., and Das, B.M : A study of numerical taxonomy and group divergence in five Mongoloid population groups of Assam. *J. Hum. Ecol.*, **5** : 179-183 (1994).
- Das, B.M., Das, P.B., Das, R., Walter, H. and Danker-Hopfe, H. : Anthropological studies in Assam, India: 2. Observations on Muslims. *Anthrop. Anz.*, **43**: 299-310 (1985).
- Das, B.M., Das, P.B., Das, R., Walter, H. and Danker-Hopfe, H. : Anthropological studies in Assam India: 3. Observations on three Brahmin Groups. *Anthrop. Anz.*, **44**: 35-43 (1986).
- Das, B.M., Das, P.B., Das, R., Walter, H. and Danker-Hopfe, H. : Anthropological studies in Assam India: 4. Observations on the Kalitas. *Anthrop. Anz.*, **44** : 105-115 (1986).
- Das, B.M., Das, P.B., Das, R., Walter, H. and Danker-Hopfe, H. : Anthropological studies in Assam India: 5. Observations on four further caste groups (Jogis, Hiras, Kumars, Kaibartas). *Anthrop. Anz.*, **44**: 239-248 (1986).
- Das, B.M., Walter, H., Gilbert, K., Lindenberg, P., Malhotra, K.C., Mukherjee, B.N., Deka, R., and Chakraborty, R. : Genetic variation of five blood polymorphisms in ten populations of Assam, India. *International Journal of Anthropology*, **2** : 325-340 (1987).
- Penrose, L.S. : Some notes on discrimination. *Ann. Eugen.*, **13** : 228 (1947).
- Penrose, L.S. : Distance, size and shape. *Ann. Eugen.*, **18** : 337-343 (1954).
- Rao, C.R. : *Advanced Statistical Methods in Biometric Research*. John Wiley, New York (1952).