People of Arunachal Pradesh: An appraisal of biocultural variation

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ABSTRACT

Background and objectives: Arunachal Pradesh is the homeland of a large number of tribal communities. Although a wide range of variation between these populations can be seen in respect of socio-cultural practices, religious beliefs, languages as well as major metric characteristics in Arunachal one can see the theory of unity in diversity. This study examines the people of Arunachal Pradesh in terms of biocultural variation.

Material and Methods: This study is based on the materials collected from different secondary sources. To understand the cultural variation of Arunachal populations the variation in religion, language, and migration and material culture were considered. While to study the biological variation anthropometric and climatic factors (i.e. annual rainfall, altitude, relative humidity and mean annual temperature) were considered.

Results: Considering anthropometric characters of 21 endogamous groups of Arunachal Pradesh the findings do not seem to provide any interesting corroboration between morphometric characteristics and the intra- and intergroup relationship. While the biological variables are taken together they dependent largely on temperature, followed by altitude, annual rainfall and relative humidity. However, altitude seems to be the principal component for stature, whereas cephalic and total facial index seems to be largely dependent upon mean annual temperature.
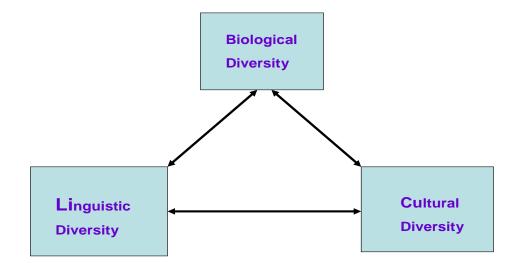
Conclusion: Findings of the present study indicate that all these population groups are residing in their present habitat since the time immemorial and they have adopted themselves to their particular habitat in Arunachal Pradesh.

***Key words:** Biocultural diversity. Arunachal populations. Ecological adaptation.*

INTRODUCTION

Nowhere in the world one can find a country better known for its unity of all its diversities than India- a land of diversities and an amalgamation of cultural and traditional heritage. India - which embodies pluralism, multi-lingual-ism and multi-cultural-ism is a diverse country which is united as a "union of states" and known as Sovereign, Democratic, Secular, Republic which guarantees certain fundamental rights to all its citizens irrespective of caste, creed, colour or gender/economic conditions and follows the principles of social and economic justice while formulating its policies and promotes equality, fraternity, peace and justice among its countrymen (Unity in Diversity is the essence of Incredible India! – undated).

Biocultural diversity comprises the diversity of life in all of its manifestations-biological, cultural and linguistic. The diversity of life is made up not only of the diversity of plants and animal species, habitats and ecosystems found on the planet, but also of the diversity of human cultures and languages (Maffi – undated). This manifestation of diversity is shown below in a schematic diagram.

The three manifestations of diversity (after Maffi - undated)

Arunachal Pradesh - a mountainous, horse – shoe shaped territory serves as the sentinel of our land on the North-Eastern corner of country. This state is the home of a large number of tribes. As per 2011 census the 83,743 sq km of land of Arunachal Pradesh is in- habited by a population of 1383727, of which 69% are tribes. The sex ratio being 920 females for each 1000 males. Arunachal Pradesh is characterised with a relatively sparsely populated area with a population density of 17 per km^2.

It is worthwhile to mention the divergent climatic conditions of the State. The climate varies from place to place, depending upon the undulating topography and altitude of the areas. Winter, in general, is cold and moist and the temperature ranges between 0^0c and 20^0c in the south. In the northern part of the State, the temperature sometimes drops to below freezing point. There is also a heavy snow-fall in the valleys at high altitudes (Dutta 1996). The mean annual rainfall in Arunachal Pradesh is between 2000 and 5000 mm.

All the tribal populations in Arunachal Pradesh are of Mongoloid origin. It is interesting to mention that every tribe has its own unique set of traditions and customs. Most of them follow their indigenous religions which are highly inclined towards nature. Although language spoken by the tribes of this state belongs to Tibeto- Burman branch of the Sino- Tibetan family of languages, they speak some 60 to 70 dialects independent of each other. Side by side, a wide range of variation between these populations can be seen in respect of major metric characters. In this backdrop an attempt has been made in this study to examine the people of Arunachal Pradesh in terms of biocultural variation.

MATERIAL AND METHODS

Cultural and biological variations were examined separately. Materials of this study were collected from different published sources. Cultural variations of the people of Arunachal Pradesh were examined in terms of religion, language, migration and material culture. To understand biological variation of these people, anthropometric and climatic factors (i.e. annual rainfall, altitude, relative humidity and mean annual temperature) were considered. Interrelationship between body measurements and climatic factors was examined using step-wise multilinear regressions method.

CULTURAL VARIATION

The culture of Arunachal Pradesh is truly varied in the sense that the state has many tribes including sub-tribes. Culture of this state changes from one place to another. Although most of these tribes descend from the same Mongoloid stock, they have developed indigenous cultural identities over the years. Cultures in this state manifest themselves in the rituals, belief systems and the festivals of each group. The culture of Arunachal Pradesh, despite their variance, can be divided into three broad cultural groups (Arunachal Pradesh Culture - undated).

(1) The Buddhist culture: Arunachal Pradesh culture has a strong presence of Buddhism. The Monpa and Sherdukpen of Tawang and West Kameng districts adopt the Lamaistic ethics of Mahayana sect of Buddhism, whereas the Khampti and Singpho of eastern part of Arunachal Pradesh follow Hinayana sect of Buddhism. Their religious belief is abounding in Buddhist style buildings and houses. They are said to have arrived from Thailand and Burma, whose religious favour is observed in their adherence to the script that they carried all the way from their original homeland.

(2) The Animist culture: This cultural group of the people of Arunachal Pradesh are – Adi, Aka, Apatani, Bangni, Nishi, Mishmi, Miji, Tangsa etc. Donyi-Polo is the major religion of these animist people. It is the belief in the worship of Sun and Moon. It has had the most influence in the lifestyle of these people. Their festivals and the rituals are held on special solar and lunar occasions.

(3) The Vaishnavite culture: This cultural group comprises of the Nocte and Wancho. They follow a very basic and rudimentary form of Vaishnavism. They live in villages, which are governed by a strict code of hierarchy, with the head of the village still occupying a significant position (Arunachal Pradesh Culture – undated).

Language variation: Arunachal Pradesh is considered as the paradise for the linguist. Although the tribes speak Tibeto-Burman branch of the Sino-Tibetan family of languages in general, there dialects are independent of each other. None of the tribes has any script for their languages except Khampti who has its own script and a relatively important literature. Language of the Khampti however, belongs to the Siamese-Chinese branch. The Monpa use Tibetan script for their religious scriptures. The languages of the Arunachal tribes are rich in vocabulary and expression pertaining to their culture. In spite

of the differences the languages of these people have some common features. Such as, they all use classificatory term in counting objects and do not have well defined tense system as are found in the Indo-European languages (Dutta 1996).

Variation in material culture: According to Dutta (1996), on the basis of material culture, the whole Arunachal Pradesh can be divided into three cultural areas.

First group: In the first group the Monpa, Sherdukpen, Memba and Khemba can be included. They practice terrace cultivation and domesticate animals viz. pony, yak, sheep etc. These people build their houses with stone and wood, whose dress and costumes are mainly made from wool.

Second group: This group consists of a large number of tribes viz. Apatani, Nishi, Hill Miri, Adi, Mishmi, Nocte, Wancho, Tagin etc. Main feature of material culture of the people of this group is shifting cultivation and hunting except the Apatani who practice mainly wet-rice cultivation. Tribes of this group live in pile-dwellings made of bamboo and leaves. Their costumes are made of cotton.

Third group: In the third group the Khampti and Singpho can be included. They practice wet-rice cultivation and their domesticated animals include the buffalo and elephant.

Origin and Migration

Regarding origin of the people of Arunachal Pradesh and their present habitat or whether they are the autochthones of the land, no written records are available. The people narrate their origin on the basis of myths prevalent among them (Dutta 1989).

Whatever may be the mythological belief of the people about their origin it is however a fact that none of the tribal group identify their present habitat as the place of origin. Looking at the map of Arunachal Pradesh and its location one can easily infer that if the people of Arunachal Pradesh have not gone from the plains of Brahmaputra valley into these hills, then they definitely have come either from Tibet, China or Burma (Dutta 1989).

In his "The Indo Mongoloid" Dr. Suniti Kumar Chatterjee has mentioned that when the migration of the Indo Mongoloid took place towards South East Asia a branch of that great human mass entered the hills of Arunachal Pradesh from Burma (cf. Dutta 1989).

BIOLOGICAL VARIATION

To find out biological variation of these people data were collected from the project report entitled "Bio-genetic Survey of Arunachal People" (Goswami and Das 1990), conducted by the Directorate of Research, Government of Arunachal Pradesh. It consists of a sample of 2772 adult males, aged from 21 to 55 years, from different populations (including sub-populations). The data include means and standard deviations of stature, head and face measurements (i.e. head length, head breadth, total facial height and bizygomatic breadth) along with the indices (i.e. cephalic and total facial index). In this section of study altogether 21 population groups were taken into consideration (Fig. 1). It is to be noted that among these populations there are three groups namely the Monpa, Adi and Mishmi, whose sub-groups were also considered as separate populations in the present investigation.

In Table 1 mean and standard deviation values for the stature, head and face measurements are presented. It reveals that the Tawang Monpa with a mean of 162.45 cm are the tallest, while the Tangsa with a mean value of 152.21 cm are the shortest. The range of mean indicates that all the populations are short to below medium in stature. Mean values of the head length do not vary more than 2 cm among these populations. In case of head breadth, total facial height and bizygomatic breadth also the mean values do not show much variation.

Table 1: Means and standard deviations of stature, head and face measurements (after Adak 2004)

Population	No.	Stature (cm)		Head length (cm)		Head breadth (cm)		Total facial height (cm)		Bizygomatic breadth (cm)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1. Sherdukpen	125	160.66	5.17	18.91	0.61	14.75	0.46	12.04	0.56	14.08	0.48
2. Aka	109	155.77	6.41	18.69	0.56	15.00	0.49	11.97	0.54	14.05	0.49
3. Nishi	117	156.40	5.69	18.79	0.57	14.41	0.66	11.09	0.53	13.83	0.52
4. Khowa	96	157.55	4.70	18.43	0.57	15.03	0.34	11.53	0.54	14.24	0.39
5. Miji	212	157.76	6.06	18.82	0.54	14.71	0.46	11.23	0.57	14.01	0.43
6. Dirang Monpa	140	160.60	5.26	18.87	0.54	14.92	0.63	11.64	0.64	13.66	0.53
7. Tawang Monpa	143	162.45	5.02	19.21	0.62	15.30	0.60	11.79	0.73	13.68	0.58
8. Kalaktang Monpa	160	158.87	5.91	18.73	0.63	15.42	0.49	11.64	0.58	13.53	0.53
9. Hill Miri	100	157.74	6.89	19.52	0.61	14.80	0.50	12.80	0.61	14.14	0.43
10. Tagin	130	160.87	5.54	19.04	0.57	14.66	0.51	11.45	0.57	13.25	0.52
11. Apatani	268	161.05	8.35	18.85	0.98	15.08	0.65	11.95	0.65	13.84	0.65
12. Adi Gallong	141	161.63	5.70	19.10	0.57	14.06	0.59	11.75	0.63	13.51	0.58
13. Adi Minyong	116	156.99	5.03	19.07	0.54	14.19	0.44	11.61	0.60	13.68	0.46
14. Digaru Mishmi	140	157.85	5.85	18.83	0.61	14.65	0.54	11.81	0.56	13.80	0.51
15. Idu Mishmi	107	154.42	5.93	18.88	0.61	14.66	0.57	11.30	0.56	14.02	0.53
16. Miju Mishmi	120	158.12	5.36	19.03	0.61	14.70	0.49	11.94	0.52	14.01	0.49

17. Khampti	101	159.95	6.16	18.68	0.68	14.59	0.68	12.02	0.56	13.68	0.75
18. Wancho	127	159.27	5.19	18.77	0.52	15.38	0.58	11.85	0.58	14.01	0.43
19. Nocte	108	160.83	5.54	17.52	1.53	14.28	0.59	11.74	0.67	13.75	0.56
20. Tangsa	136	152.21	5.89	19.03	0.57	14.36	0.49	11.69	0.58	13.79	0.46
21. Singpho	76	158.31	6.01	18.63	0.67	14.52	0.57	11.70	0.53	13.63	0.54

It is rather difficult to assess the intergroup relationships based on univariate analysis of the data. In this case we face the problem of biological taxonomy. To understand such a problem, the multivariate distance analysis is helpful. On the basis of the five anthropometric measurements considered in the present study, the taxonomic distances are calculated among the 21 population groups of Arunachal Pradesh. The distance values are presented in Table 2. The values are obtained according to the formula of Ward (1963):

Taxonomic distance:

$$Dij = \left[\sum_{k=1}^{n} (Xik - Xjk)2 \right] 1/2$$

It is the taxonomic distance (i.e. Dij) of the 'ith' and 'jth' of 'kth' variables, where Xik= mean of character 'K' in population 'i', Xjk= mean of character 'K' in population 'j', and k= number of characters.

Following the methodology of Singh (1996) a dendrogram has been computed (Fig. 1) on the basis of data given in Table 2. From the dendrogram it appears that there are six distinct clusters.

Cluster I: constituted by the Digaru Mishmi, Singpho, Khampti, Sherdukpen and Miju Mishmi;

Cluster II: constituted by the Aka, Wancho and Khowa;

Cluster III: constituted by the Dirang Monpa, Apatani, Tawang Monpa and Kalaktang Monpa;

Cluster IV: constituted by the Nishi, Miji, Idu Mishmi, Adi Minyong and Tangsa;

Cluster V: constituted by the Tagin and Adi Gallong;

Cluster VI: constituted by the Nocte and Hill Miri.

It is seen that the Wancho, one of the Naga groups of Arunachal Pradesh, are placed in the same cluster (i.e. cluster II) with the Aka and Khowa. Side by side, the Mahayana Buddhist group like the Sherdukpen and Hinayana Buddhist group like the

Khampti and Singpho are placed in the same cluster (i.e. cluster I) with the Digaru Mishmi and Miju Mishmi. Thus, it appears from the dendrogram that it would be very difficult to arrive at any conclusion regarding their intra- and inter-group relationships.

Table-2: Taxonomic distance among 21 population groups of Arunachal Pradesh (after Adak 2004)

Population	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1.S. pen	-	2.0	3.6	2.5	2.6	2.2	2.6	3.3	3.0	3.9	1.4	3.2	3.0	1.8	3.3	1.2	1.9	1.9	4.3	3.9	2.5
2.Aka		-	3.2	1.8	2.8	2.8	3.5	2.9	3.4	4.4	2.4	4.4	3.1	1.8	2.3	1.6	2.5	1.8	4.5	2.8	2.6
3.Nishi			-	2.9	1.3	2.8	4.2	3.6	5.6	3.4	3.6	3.4	1.9	2.3	1.5	2.9	3.2	3.7	4.3	2.5	2.2
4.Khowa				-	1.9	3.0	3.9	3.3	4.8	4.8	2.8	4.8	3.7	2.5	2.3	2.4	3.2	2.0	4.1	3.8	3.0
5.Miji					-	2.3	3.4	3.1	5.0	3.5	2.8	3.6	2.4	1.9	1.4	2.1	2.9	2.6	4.3	3.0	2.2
6.D. Monpa						-	1.6	1.7	4.5	2.0	1.3	2.6	2.5	1.5	3.2	2.1	1.5	2.1	4.1	3.8	1.6
7.T. Monpa							-	2.1	4.3	2.8	1.5	3.5	3.8	2.8	4.3	2.8	2.7	2.2	5.4	4.9	3.1
8.K. Monpa								-	5.1	2.7	2.1	4.0	3.6	2.5	3.6	3.1	2.6	2.1	4.7	4.2	2.5
9.Hill Miri									-	5.7	3.6	4.9	4.5	3.7	4.9	2.9	3.9	3.9	6.7	4.5	4.6
10.Tagin										-	3.1	2.2	2.8	2.9	4.2	3.7	2.7	4.0	4.8	4.3	2.3
11.Apatani											-	3.2	3.2	1.8	3.5	1.8	1.6	1.3	4.3	4.2	2.3
12.A.Gallo												-	2.1	2.6	4.2	3.1	2.2	4.4	4.4	4.1	2.3
13.A. Miny													-	1.6	2.4	2.2	2.3	3.8	4.5	2.1	1.6
14.D.Mish														-	2.2	1.1	1.2	2.3	3.9	2.5	1.0
15.I.Mish															-	2.4	3.4	3.2	4.9	2.0	2.7
16.M. Mish																-	1.9	2.0	4.6	2.8	2.1
17.Khamp																	-	2.6	3.4	3.5	1.2
18.Wancho																		-	4.7	4.2	2.9
19.Nocte																			-	5.4	3.2
20.Tangsa																				-	2.8
21.Singpho																					-

1. S. pen= Sherdukpen; 6. D. Monpa=Dirang Monpa; 7. T. Monpa= Tawang Monpa; 8. K. Monpa= Kalaktang Monpa; 12. A. Gallo= Adi Gallong; 13. A. Miny= Adi Minyong; 14. D. Mish= Digaru Mishmi; 15. I. Mish= Idu Mishmi; 16. M. Mish= Miju Mishmi; 17. Khamp= Khampti
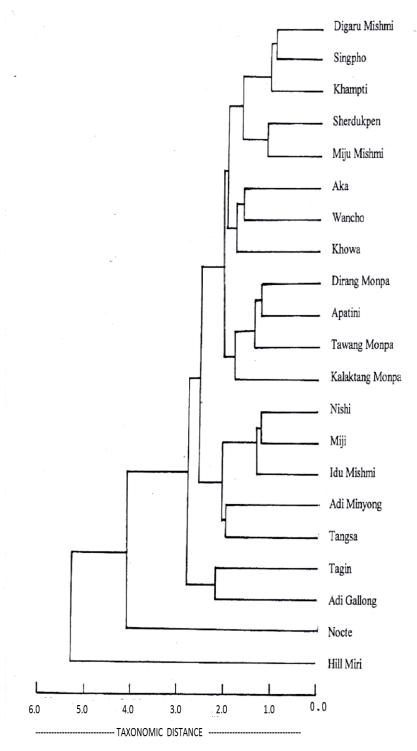
Fig.1: Dendrogram based on taxonomic distance (after Adak 2004)

INTERRELATIONSHIP BETWEEN BODY MEASUREMENTS AND CLIMATIC FACTORS

In this section an attempt has been made to examine the association between the biological variables (i.e. stature, cephalic index and total facial index) and climatic factors (i.e. annual rainfall, altitude, relative humidity and mean annual temperature). It is to be noted that data on climatic factors were collected from different Statistical Handbook of Arunachal Pradesh.

Table-3: Selection of independent variables by step-wise multilinear regressions. Values of single and multiple coefficient of correlation (after Adak 2004)

Dependent variable	Independent variable (climatic factors)	Coefficient of correlation
Stature	A	0.2002
	A+R	0.2287
	A+R+H	0.2666
	A+R+H+T	0.2949
Cephalic index	A	0.3477
	A+R	0.0253
	A+R+H	0.3327
	A+R+H+T	0.4709
Total facial index	A	0.1048
	A+R	0.0728
	A+R+H	0.0763
	A+R+H+T	0.2829

A= Altitude, R= Rainfall, H= Relative humidity, T= Mean annual temperature

Keeping anthropometric variables as dependent and climatic factors as independent, the relationship between biological variables and climatic factors have been studied by stepwise multilinear regression analysis (STPRG). The results are presented in Table 3. It is found that in Arunachal Pradesh the cephalic index seems to be much more affected by the climatic factors (i.e. r = 0.4709) than either stature or total facial index. Further the selection of independent variables by STPRG are ranked as 1, 2, 3 and 4 respectively, as per their selection in the regression equation and are presented in Table 4. Here the lower values of ranking suggest higher association.

Table-4: Ranking of climatic factors in biological variables estimation (after Adak 2004)

Biological variables	CLIMATIC FACTORS			
	Annual rainfall	Altitude	Relative humidity	Mean annual temperature
Stature	2	1	3	4
Cephalic index	3	4	2	1
Total facial index	3	2	4	1
All categories and biological variables combined	8	7	9	6

It appears from Table 4 that while the biological variables are taken together they dependent largely on temperature, followed by altitude, annual rainfall and relative humidity. However, altitude seems to be the principal component for stature, whereas cephalic and total facial index seems to be largely dependent upon mean annual temperature.

DISCUSSION

People of Arunachal Pradesh mainly comprise of Tribal populations. Geographically, the cultural diversity of Arunachal Pradesh can be roughly divided into cultural spheres, on the basis of tribal identity, religion and language. However, endogamy exists in general and thereby biological isolation is by and large maintained by each of the populations. Though these populations widely vary in respect of socio-cultural practices and metric characteristics, in Arunachal we see the unity in diversity.

On the basis of clusters formed by anthropometric characteristics it appears that there is no interesting corroboration with their intra- and intergroup relationships. The multiplicity of weather events of a locality or an area is called its climate (Landsberg 1982). Essence of man's history on this earth is the sequence of combined adaptations to climate and culture. Climate is the progression of environments on the habitable surfaces of the earth during human's brief life span. In their bodies and in their patterns of behaviour, the human beings alive today reflect the climatic changes to which their ancestors were exposed and which they met by suitable modifications in order (technologically speaking) to have begotten us (Coon 1982).

The various 'Mendelian' populations with different genetical make-up, living under different ecological condition in India, provide an ample opportunity to the anthropologists and human ecologists to study this problem of ecological adaptation (Malik et al. 1980). Singh et al. (1977) found in India an inverse relationship between average rainfall of an area and the mean stature of its inhabitants. Hiernaux (1974, 1977) suggested the association between stature and annual rainfall as biological adaptations. Accordingly, Abe and Tamura (1980) also examined the morphological variations of the head of subjects in 16 areas of Japan by geographic latitude.

Thus in fine, it can be inferred that the intra- and inter-population variation in Arunachal Pradesh may be associated with many biological and environmental factors. In this respect, it is to be mentioned that in fact selection operates ultimately on the overall phenotype of the individual and every component of the environment determines the nature and intensity of the selection. Therefore, environmentally determined adaptability must itself have a genetic basis produced by selection, and this adaptability will interact with the environmentally rigid adaptations (Harrison 1966). Findings of the present study suggest that the climatic factors are playing a very important role in regulating the variation in anthropometric characters among different populations of Arunachal Pradesh. The tribes of this state settle down in different ecological settings of the state since the time immemorial and they have adopted themselves to their particular habitat. And in Arunachal one can see the theory of unity in diversity.

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