PRINT: ISSN 0970-9274 ONLINE: 2456-6608
J. Hum. Ecol., 11(2): 125-138 (2000)
DOI: 10.31901/24566608.2000/11.02.04

Genetic Affinity Among Caste and Tribal Populations of India

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INTRODUCTION

The Indian population is divided into a large number of endogamous sub-populations consisting of different castes, languages, religions and tribes. Roughly speaking, three races namely, Caucasoids, Mongoloids and Australoids with their sub-types constitute the people of India. Caucasoids of Mediterranean type are dominant in north-west and Gangetic plain. Mongoloids of some ethnic groups are present in the sub-Himalayan region and the north-east and Australoid and more specially Veddoid strains are evident among the tribal populations of south (Mourant et al., 1976).

Throughout the history many population groups migrated successively to India from north-west and north-east. It is believed that the ancestors of some existing tribes in south India entered the country from the north-west in prehistoric times. Some of the migrant populations maintain their genetical identity while others are dissolved by interbreeding with the general population. Cases are not rare that populations living side by side for hundred or even thousands of years retain their genetic differences by practising endogamy.

Evolutionary forces like selection, migration or gentic drift might play important role in changing the gene frequencies of some isolate populations.

Every state in India has a large number of endogamous castes, who have confined their marriages within the caste, and within a number of familial lines. Endogamy must have channelled blood along restricted lines. Small sections of castes also behave as endogamous units, and among them the opportunities for a recessive defect to show up are much greater than where the groups are widely based. Biological anthropogists believe that the break up of social isolates leads to an increased incidence of heterozygotes, of dominant types in the resulting population. Endogamy of religious groups leads to differentiation of the people. Hindus, Muslims, Christians, Sikhs, Buddhists and Jains are the major religious communities. The Hindus are divided into hierarchial Varnas, Brahmans (priests), Kshatriyas (Warrior), Vaishyas (traders) and Shudras. The Brahmans in different parts of country are not homogeneous with respect to their languages and physical characteristics, nor are the castes next to the Brahmins. Caste subdivisions among the Hindu are not only social but also biological. Caste endogamy is the rule.

It is generally followed more strictly in high castes than in lower castes. Besides caste endogamy, consanguineous marriage is a common practice among the Hindus and Tribes in some southern states. The Muslims, however, practice it at variable degrees throughout the country (Roy Choudhury, 1976a,b).

The tribes constitute eight per cent of the Indian population and they are distributed in different regions. The tribes are distinguished from one another in language, culture and biological characteristics. About 90 per cent of the tribal populations are engaged in agriculture and rest in activities like household industries, mining, quarrying, animals husbandry, forestry, fishing and hunting (Chandra, 1968).

For many years anthropologists have studied the problem of differentiation in Indian populations by archaeological or linguistic evidence as well as by fossil records and morphological characters. The conclusions reached by all these evidences are not incomplete agreement. Fossil records are fragmentary and not always available. On the other hand morphological characters such as skin colour, stature, shape of head or nose etc are subject to change by environmental factors.

An alternative approach to study the differentiation of human populations is to use ge-

netic markers. They are stable and not susceptible to environmental factors. The study of genetic variation using population structure is dependent upon the collection of data in time and space. For analysis of the genetic structure of populations and their evolutionary dynamics, it is essential that data be collected with some objectives in mind. If a genetic survey collects data on the variation of gene frequencies in different populations or in the some population in different geographical regions, and geographical diversity in gene frequency is demonstrated to answer the question whether such diversity is the result of genetic drift, information is required on the drift associated factors of population size and rate of gene exchange.

Most approaches analysis other than the purely descriptive genetic differentiation in human populations of local variation can be classified into distance approaches and structure approaches. The genetic distance approach converts differences in gene frequencies into a set of "distances" among populations-increasing distances are assumed to indicate increasing evolutionary divergence. Since genetic distance statistics can be written as functions of population structure and since there exist models to predict population structure statistics from demographic history and genetic variation, the population structure approach appears to be more verastile method of studying gene frequency variation. It can also be helpful in assessing the relative contribution of natural selection and random genetic drift to genetic variation. Due to fast-moving technology, human migration is now so complex and all pervasive that it is difficult to analyse the microgeographic variation in western societies. Nevertheless, to demonstrate the effect of stabilizing evolutionary forces, data on certain isolated populations in the west has been useful. In contrast, in the eastern hemisphere and especially in the Indian subcontinent, many human groups still preserve their original structure although migration within areas has just started. In Indian conditions the social structure in the form of the caste system has also played a major role in the preservation of the original gene pools in various populations. Each caste group in Hindu society practises endogamy and thus constitutes a discrete population group. Although these groups are quite large, they may well be further divided into small isolated groups due to ecological barriers.

When there are so many subdivisions of Indian populations, it is important to know the nature and extent of genetic affinities among them. With the accumulation of gene frequency data for a number of blood group, protein and enzyme loci and the development of statistical methods for measuring genetic distance between populations, there has been a tendency in recent years to study genetic affinities of Indian populations.

In the present paper an attempt has been made to study the magnitude of genetic affinity among caste and tribal populations of various regions of India with the available gene frequency data for blood groups, proteins and red cell enzymes keeping in mind the historical, linguistic and socio-cultural perspectives.

MATERIALS AND METHODS

The gene frequency data for blood groups, proteins and enzymes for various caste and tribal population groups of India were collected from published literature. The choice of populations from various regions were selected in a such a way that the number of common loci available for comparison was maximum. The number of common loci varies from four to seventeen. Both polymorphic and monomorphic loci have been taken in the present study.

From the matrix of genetic distances (Nei, 1972, 1987), the unweighted pair group method has been used to construct the dendrogram of the populations (Sneath and Sokal, 1973) and on the basis of these dendrograms the affinities of various caste and tribal populations have been discussed and because of limited page numbers the values of genetic distances are not being given but the particular reference.

RESULTS AND DISCUSSION

Historical, Linguistic, Socio-cultural and Genetic Perspectives

A far as Indian populations are concerned, there have now been many investigations of ABO, MN and Rh(D) bloodgroups. Yet in view of the vastness of the country and its people and the number of caste and tribal groups, such studies are relatively few. Only selected populations have been tested with all antisera for MNSs and Rhesus blood group systems, and data for Kidd, Duffy, Lutheran, Kell, Lewis and P system are extremely limited. The biochemical polymorphisms entered the field of Indian population genetics only in 1969 when the first investigation was reported by Ananthakrishna and Kirk on two endogamous groups from south India. Although the efforts for the last twenty nine years have produced a considerable number of such studies, the over all data are far from complete and many regions are still untouched. Due to non-availability of anti-sera and chemicals etc. the focus from biochemical parameters to DNA polymorphisms and other fields of biological anthropology is being shifted by Indian anthropologists. Very few studies on serological and biochemical markers have been reported in the last decade.

Majumdar's (1958) conclusion regarding ABO allele frequency variation in caste and tribal populations of India was that:

(i) These fluctuations indicate considerable admixture between various racial and cultural groups,
(ii) The migration into India could not have been from one direction alone, and
(iii) The decrease of the B blood groups from east to west and from south to north may be considered racially significant.

However, he adds, "until we get further data on blood group distribution, we shall not be able to construct migration charts of races."

An attempt to construct the genetical relationship of populations of the Indian peninsula on the basis of blood group data was made by Balakrishnan (1978). Using data for 102 selected population samples from the Indian subcontinent for which the ABO and rhesus gene frequencies were available, he computed paired wise genetic distances among them and performed a cluster analysis. Two main inferences drawn in the study are:

(i) In general, tribal populations stand out distinctly from the non-tribal populations,
(ii) Four ethnic clusters - Causacoid - Aryan, Causcasoid-Dravidian, Australoid and Mongoloid could be discerned, and all populations from the Indian sub-continent could be placed in one of these clusters.

The detailed genetical characteristics of caste and tribal population have been reported by Roy Choudhury (1984, 1991), Bhalla (1984), Kapoor (1992) and Bhasin et al. (1994).

Throughout the historical times, north western India has been a vulnerable area for foreign invasions and widespread migration of different population groups occurred in northern and western India. The people of Sind (Pakistan), Panjab and Rajasthan in the north migrated to Gujarat; so did the people of Karnataka and Kerala in the south to Maharasthra. Indo-Aryan language in western India supports the influence of the north, while its cultural practice like wedding ceremonies follows the custom of south (Sanghvi, 1966). There are various caste groups and tribes in western India. In Gujarat there are Audich and Nagar Brahmans who stand the highest in Hindu social order. The Audich Brahmans are northerner and are believed to have migrated to Gujarat from Rajasthan around the later part of the tenth century A.D. The Lohana and Vania are trading communities in Gujarat and their ethnic relationship is not clear. The Lohanas are supposed to have migrated to Gujarat from Sind and Panjab. The Vania are believed to have migrated from Rajasthan in Gujarat around the seventh century A.D. They have a number of subdivisons like Visa Oswal, Jain, Lad Vania, Kapol Vania, Vania Soni (Undevia et al, 1978). In Gujarat there are twenty nine scheduled tribes. Among the tribes the most numerically dominated are the Bhil, Dubla, Dhodia, Naika, Gamit and Rathawa. It is speculated that all smaller tribes of Western India are the subdivision of the

Bhil who are one of the largest tribal groups in India. The Bhil are believed to be the earliest settlers in this country (Doshi, 1971) and are scattered over a wide area comprising western Madhya Pradesh, Rajasthan, Gujarat and Maharasthra. The Bhil of Maharasthra have greater degree of genetic affinity with the Pawara tribe than with the Katkari tribe and all of them are distantly related to non-tribal populations (Mukherjee et al., 1979). Their mother tongues are classified under Bhill of the Indo-Aryan language family.

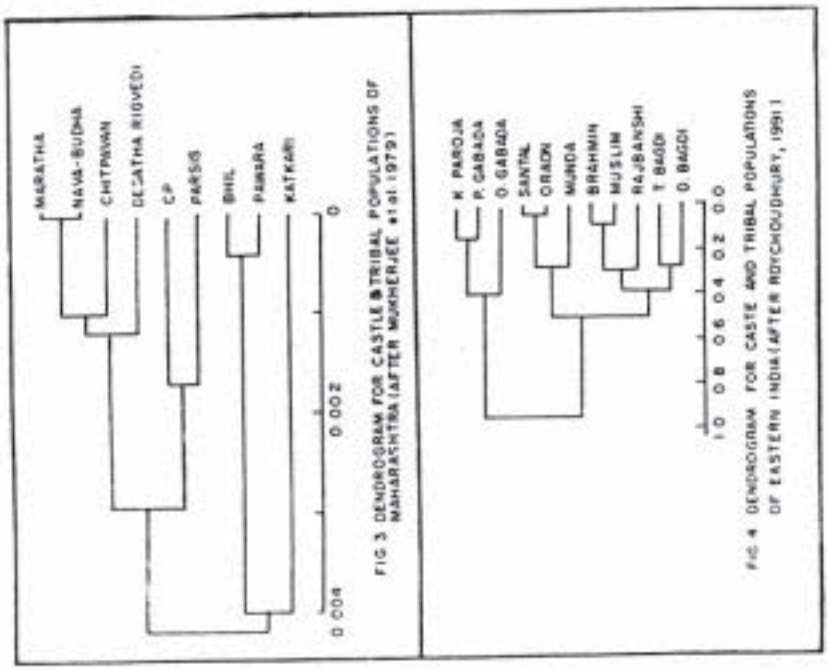
Genetic studies of seven tribes in Gujarat namely Bhil, Naika, Dubla, Dhodia, Koli, Gamit and Dhanka, three caste populations namely Audich Brahmans, Visa Oswal Jain and Lad Vania and three tribes *viz.*, Warli, Dhodia and Konkona of the Union territory of Dadra and Nagar-Haveli were studied by Vyas et al.(1962), Parikh et al. (1969) and Joshi et al. (1978) on the basis of five polymorphic loci. On the basis of five loci the genetic distances have been calculated and a dendrogram has been constructed (Fig. 1). It show that all the tribal populations except the Koli form one cluster, while all the caste populations form another. It can be said that tribals are racially much in common and as a group they differ from caste population more than they do from each other (Roychouchury, 1982). Similar view was expressed earlier by Majumdar and Fuchs who studied anthropometric measurements of five of seven tribes of Gujarat (Shah, 1962). The only exception is the Koli who are genetically close to caste populations. Bhasin et al. (1985) reported in their genetic studies on four tribes in Surat district that the Vasava and Kotwalia are closer to each other than either is to the Chaudhuri or the Gamit.

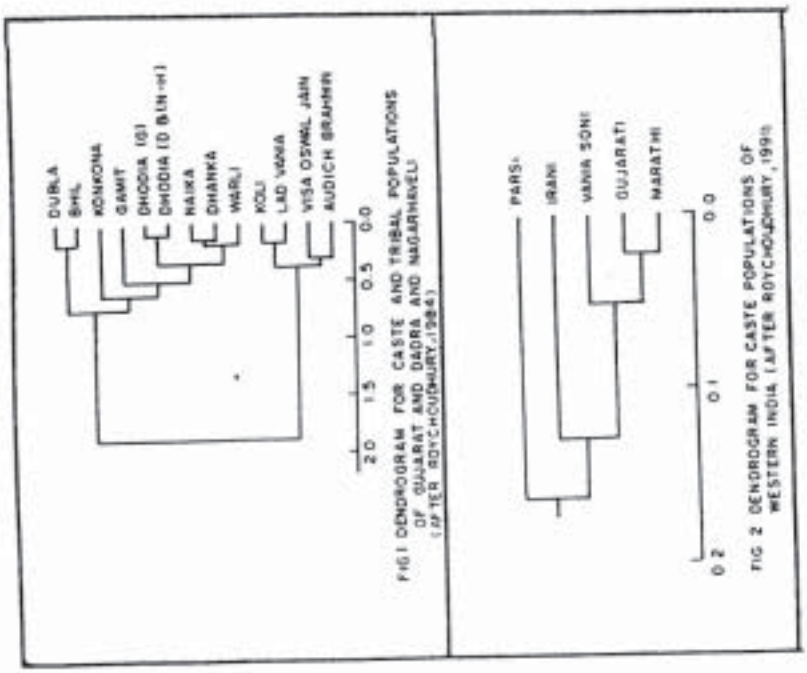
The genetic relationship of three caste populations *viz.* Marathi, Gujarati and Vania Soni and two migrant populations *viz.* Parsi and Irani in Western India have also been studied by Blake et al. (1970) and Undevia et al. (1972, 1972, 1978). A dendrogram has been constructed on the basis of fourteen common polymorphic loci and seven monomorphic loci. It has been observed that Marathi, Gujarati and Vania Soni cluster together while the Parsi and Irani are separated from the local caste populations (Fig. 2).

It can be said that Marathi and Gujarati are two linguistic communities while Vania Soni is a subdivision of Vania. Descendants from the Persian Zoroastrians who migrated to India at the end of the seventh century A.D., the Parsis, live in and around Bombay. By contrast, the Iranis of Iran came to Western India in early eighteenth century A.D.

Mukherjee et al. (1979) studied three tribes - Bhil, Pawara and Katkari; five caste groups - Deshastha Rigvedi and Chitpavan Brahmans, Maratha, Chandrasenya Kayastha Prabhu and Nava Budha and a migrant group Parsis from Maharasthra for fourteen common polymorphic loci and two monomorphic loci. The dendrogram generated from the distance matrix is given in figure 3. Two distinct clusters emerge, one consisting of the three tribal groups and other consisting of the remaining six groups. These three tribal groups show major differences with all the five caste-Hindus and the Parsis. It has been observed that clustering among these nine groups, in general, are compatible with the known ethnic history of Maharasthra (Sanghvi and Khanolkar, 1949; Karve and Dandekar, 1951; Sanghvi; 1953; Karve and Malhotra, 1968).

Eastern India is the meeting place of three ethnic groups-people with monogloid elements from the north-eastern region, caste groups of causasoid origin from the northwestern and tribals from the southern and south-western regions. The tribes of north eastern India are genetically closer to the mongoloids than to the people of northwestern India. Similarly, the tribes in Bihar and Orissa have genetic characteristics more common with those of the tribes in central and southern India than those of the tribes on north eastern India. On the other hand, the caste populations of West Bengal, Bangladesh and Assam are closer to the people of north western India than to others (Roychoudhury, 1981, 1982). The gene frequency data for the tribes and caste of Bihar, Orissa and West Bengal have been taken from Bhattarcharjee, 1956; Kumar 1957; Das et al., 1967; Chakrabory and Yee, 1973; Kumar and Mukherjee, 1975. The data comprised of five common polymorphic loci. On the basis of these data the pattern of


MARATHA
NAVA-BUDHA
CHITPAWAN
DESATHA RIGVEDI
CP
PARSIS
BHIL
PAWARA
KATKARI
0.004
0.002
0
FIG 3 DENDROGRAM FOR CASTE & TRIBAL POPULATIONS OF MAHARASHTRA (AFTER MUKHERJEE et al 1979)
K PAROJA
P. GADABA
O. GADABA
SANTAL
ORAON
MUNDA
BRAHMIN
MUSLIM
RAJBANSHI
T. BAGDI
O. BAGDI
1.0 0.8 0.6 0.4 0.2 0.0
FIG 4 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF EASTERN INDIA (AFTER ROYCHOUDHURY, 1991)


DUBLA
BHIL
KONKONA
GAMIT
DHODIA (G)
DHODIA (D BLN-HI)
NAIKA
DHANKA
WARLI
KOLI
LAD VANIA
VISA OSWAL JAIN
AUDICH BRAHMIN
2.0 1.5 1.0 0.5 0.0
FIG 1 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF GUJARAT AND DADRA AND NAGARHAVELI (AFTER ROYCHOUDHURY, 1984)
PARSI
IRANI
VANIA SONI
GUJARATI
MARATHI
0.2 0.1 0.0
FIG 2 DENDROGRAM FOR CASTE POPULATIONS OF WESTERN INDIA (AFTER ROYCHOUDHURY, 1991)

genetic relationship of eleven populations (5 caste groups and 6 tribal groups) is relfected in the dendrogram (Fig. 4). The tribes of Bihar and Orissa belong to two different clusters indicating that the geographic proximity of the tribes is more important than their linguistic affiliations which has been supported by historical accounts also (Roy, 1915). Among the caste populations in West Bengal, Rarhi Brahmins, Muslim and Rajbanshi form one group, while Tentulia Bagdhi and Duley Bagdi form another. According to Roychoudhury (1982) the genetic distance analysis shows that the low caste Hindus in West Bengal have a greater degree of genetic affinity with caste Hindus or Muslims than with the tribes in Bihar or Orissa.

Dhanker-Hopfe et al. (1988) reported that two caste groups from Assam are closely related and Muslims are more closely related to the higher caste groups than the scheduled caste. Mukherjee et al. (1989) studied eleven caste and tribal populations in Assam and found that caste populations make one cluster and tribal populations who have strong Mongoloid affinities make another cluster.

To obtain some more information on genetic relationship of the population groups of eastern India with those of north India a separate analysis has been done. The caste groups from Delhi have been taken as representative of North India (Blake et al., 1971); Bengalis from West Bengal (Das et al., 1970; Mukherjee and Das, 1970); Muslims of Bangladesh (Papiha et al., 1975); Assamese from Assam, Khasi (Meghalaya), Bhutanese and Nepalese (Flatz et al., 1972; Goedde et al., 1969, Bhasin, 1974; Sunderland et al., 1979; Mourant et al., 1969). On the basis of nine polymorphic loci, the genetic relationship among seven populations have been shown in the dendrogram (Fig. 5). The north Indians, Bengalis, Muslims, Assamese and Khasi form one cluster while the Bhutanese and Nepalese form another.

Few selected caste and tribal populations have also been studied from eastern, central and western Himalayan region.

Bhasin et al. (1986) reported genetic relationship among thirteen caste and tribal populations from Sikkim. The dendrogram has been constructed (Fig. 6) on the basis of genetic distances based on seventeen polymorphic loci. It has been observed that the study fairly reflects their ethnic and linguistic affiliations and it is further corroborated by the history of respective population.

Kapoor (1988) reported that the tribal groups of north-east Himalayas who are geographically closer are distant from other population groups of South East Asia because they belong to the same ancestral Mongoloid stock but which has higher percentage of Mongoloid elements than the Indian tribal and caste populations.

Tiwari (1984) and Kapoor (1992) studied the tribals and caste groups from Central Himalayas. The genetic distance analysis show that the tribals (Bhotia) reveal differences with other caste and tribal groups of Himalayas (Brahmans of Kumaon, Newar Shrestha of Nepal and Khasis of Assam). On the basis of genetic distance martix a dendrogram has been constructed (Fig. 7) taking into consideration six polymorphic loci. It has been observed that there seems to be a distinct tendency among caste groups to show differences with the tribal groups in Himalayas also. It has also been observed that tribals in Himalayas show stronger Mongoloid characteristics than the caste groups and the genetic analysis does not seem to deviate considerably when examined in their ethno-historical and socio-cultural perspectives. The same pattern has been observed in the caste and tribal populations of Himachal Pradesh (Western Himalayas) by Bhasin et al. (1983). The dendrogram generated from the distance matrix on the basis of eleven polymorphic loci is given in figure 8. It shows that Swangalas (tribe) stand out to be comparatively different from other caste groups. This is in agreement with the historical evidence and traditions.

Bhasin and Khanna (1992) studied the nine caste and tribal populations from Jammu and Kashmir. In these populations the genetic distances, have been calculated on the basis of eleven polymorphic loci and the dendrogram is presented in figure 9. It has been observed that there are two main clusters one of the

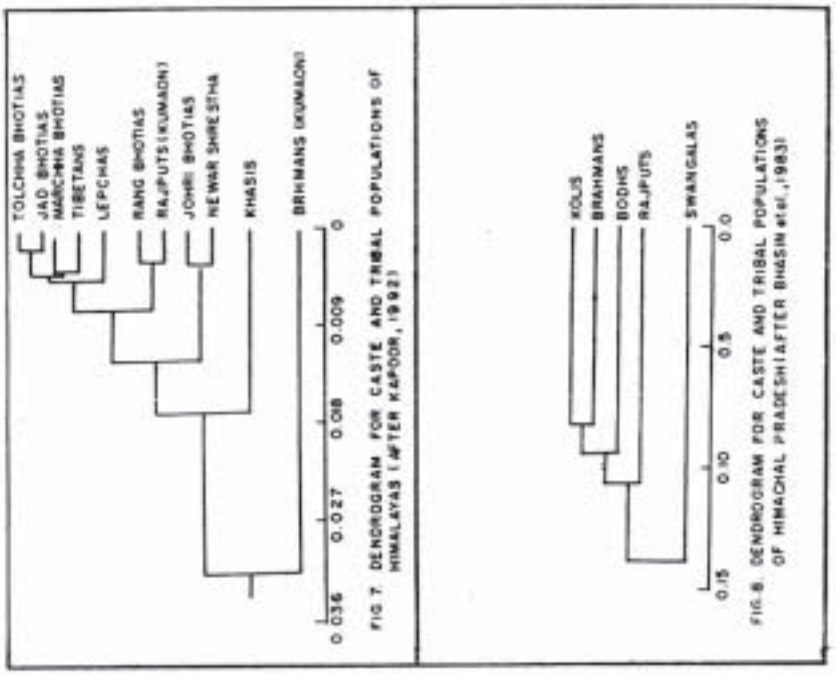


FIG 7. DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF HIMALAYAS (AFTER KAPOOR, 1992)

FIG-8. DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF HIMACHAL PRADESH (AFTER BHASIN et al., 1983)

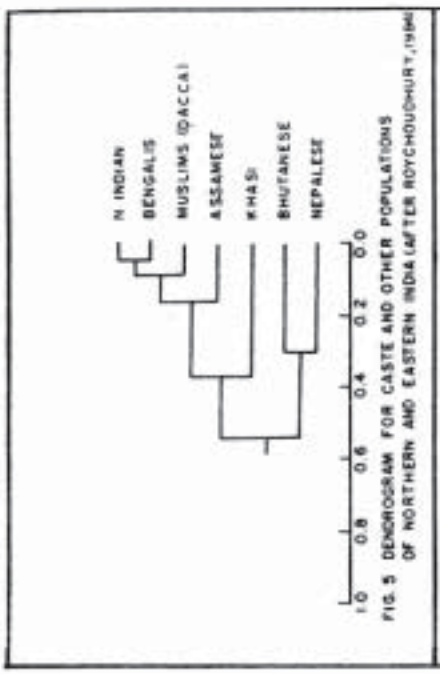


FIG. 5 DENDROGRAM FOR CASTE AND OTHER POPULATIONS OF NORTHERN AND EASTERN INDIA (AFTER ROYCHOUDHURY, 1986)

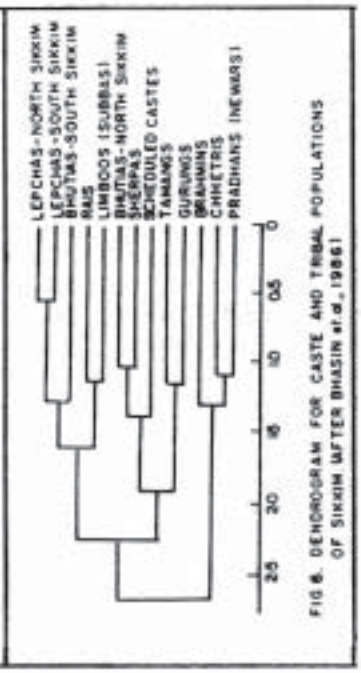


FIG 6. DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF SIKKIM (AFTER BHASIN et al., 1986)

caste populations of Jammu and Kashmir divisions and other of tribals of Ladakh. The differentiation of the two tribal groups - Bodhs and Baltis; and Tibetans of Ladakh from the Kashmiri Muslims, Kashmiri Pandits, Gujjars and Dogra caste groups, could well be due to a considerable Monogoloid admixture in the former groups as demonstrated by few selected genetic traits.

A dendrogram of sixteen caste and tribal population from Himalayan region has been presented in figure 10. The genetic distances have been calculated on the basis of five polymorphic loci. It clearly shows that the caste populations are nearer to each other than to the tribal populations (Kapoor and Tiwari, 1986).

In North India, Das et al. (1978) studied the five caste groups of Delhi on the basis of five loci. The results also receive support from anthropometric and somatoscopic observations of Risley (1915) and Guha (1937). These workers have shown that although biological rank differentiation exists in various part of India, this does not occur in northern India. The fact is revealed in figure 11. for there is no difinite clustering of the population with respect to their biological rank.

Kamboh (1984) studied the genetic relationship between Hindu caste groups and Non-Hindus from north India. It has been observed that higher caste groups are closer to each other than the low caste groups. He also studied tribal and caste population of south India and found differences between these populations. It has been found that south Indian caste populations are closer with the caste groups of North India. Kapoor and Kapoor (1985) studied the fifteen caste populations and two tribal populations on the basis of five loci from North India and Central India and observed that caste population are closer to each other than the tribal populations.

Papiha et al. (1982) studied eleven caste groups and three tribal groups from Rajasthan, Panjab and Himachal Pradesh for nine polymorphic loci (Fig. 12). It has been observed that the genetic distances between tribals and low caste groups are closer but separated from the high and middle caste groups. It has been suggested by them that the differences in genetic structure in North-West India are more likely to be due to their breeding structure, differential migration and ethnic affiliation. Furthermore within a given geographical area, it is the internal structure that regulates gentic differentiation of the various sub-populations.

In Central India, it has been reported that tribes of Madhya Pradesh seem to have biological connection with the neighbouring tribes in Bihar, Orissa and Andhra Pradesh. A dendrogram (Fig. 13) constructed from the genetic distances on the basis of five polymorphic loci among three tribes each from Bihar (Santhal, Oraon and Munda), Orissa (P. Gabada, O. Gabada and K. Paroja) and Madhya Pradesh (Dorla, Dhurwa and Bhil) and two tribes each from Gujarat (Dhanka and Gamit) and U.T. Dadra and Nagar Haveli (Warli and Dhodia) reveal that the tribes who are close geographically are separated by small genetic distances. The tribes in Bihar, Orissa and eastern Madhya Pradesh cluster separately according to their respective states. On the other hand the Bhil living in western Madhya Pradesh have strong genetic affinity with the tribes in Gujarat and Dadra and Nagar Haveli (Roy Choudhury, 1982).

A dendrogram for three tribes of Andhra Pradesh (Chenchu, Yanadi and Koya Dora) and two tribes of Maharashtra (Bhil and Katkari) on the basis of nine polymorphic loci (Ramesh et al., 1980; Reddy, 1980; Goud and Roy, 1979, 1980; Santachiara-Benereetti et al., 1972; Mukherjee et al., 1981) has been presented in figure 14. The Koya Dora have smaller genetic distances from the Katkari and Bhil than those from the Chenchu and Yanadi. The degree of genetic affinity between last two tribes is not as strong as that among first three tribes (Roychoudhary, 1982). The Lamadi found in varous districts of Andhra Pradesh are believed to have come from the north especially Rajasthan and Gujarat. It has been shown that the Lambadi are separated at a long distances from the Koya Dora and Konda Kammara and they cluster with two low caste populations namely Mala and Madiga (Walter et al., 1980a, b, 1981; 1984; Goud and Rao, 1980).

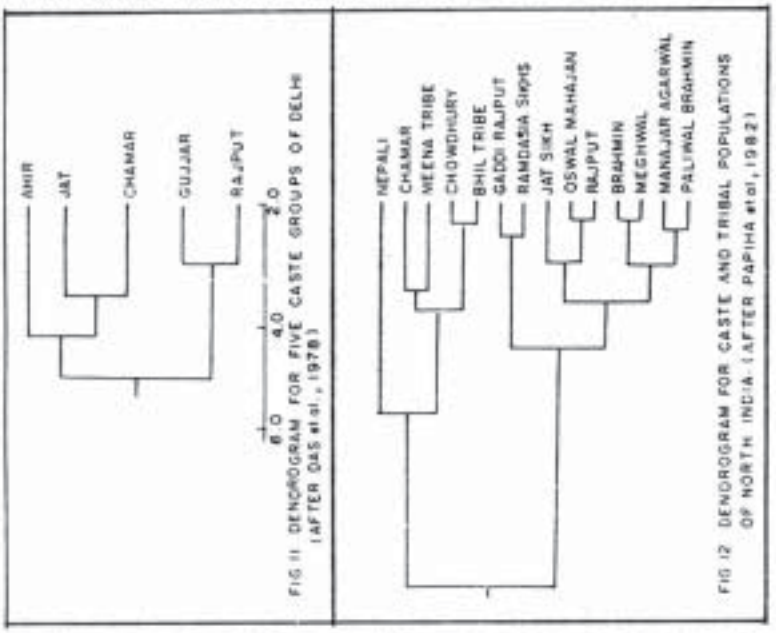


FIG 11 DENDROGRAM FOR FIVE CASTE GROUPS OF DELHI (AFTER DAS et al., 1978)

FIG 12 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF NORTH INDIA (AFTER PAPIHA et al, 1982)

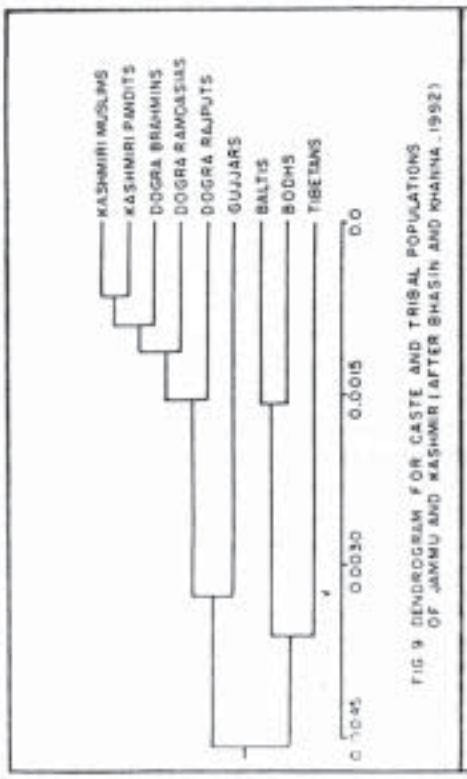


FIG 9 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF JAMMU AND KASHMIR (AFTER BHASIN AND KHANNA, 1992)

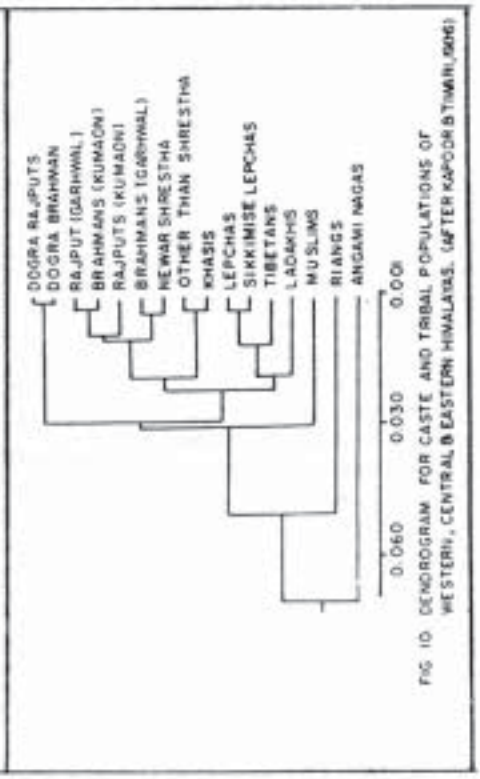


FIG 10 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF WESTERN, CENTRAL & EASTERN HIMALAYAS. (AFTER KAPOOR & TIWARI, 1986)

The genetic diversities between the five tribal groups namely Irula, Kurumba, Kadar, Toda and Kota and four neighbouring caste populations namely Brahmin, Nadar, Reddier and Thevar (Hindu) have been studied by using gene frequency data for eight loci. The data for five tribes were collected from Saha et al. (1974, 1976) and Ghosh et al. (1977), while those for caste populations from Ananthakrishnan and Kirk (1969) and Ananthakrishna (1972).

The dendrogram constructed from the genetic distances has been shown in figure 15. The Toda and Kota have greater genetic affinity with caste populations then with neighbouring tribal populations, namely, Irula, Kurumba and Kadar. Similar observations were made earlier by Ghosh et al. (1977) and Roychoudhury (1982). This observation is consistent with the results obtained by anthropometric and somatoscopic studies (Basu and Gupta, 1962).

Saha et al. (1976) studied nine caste groups and four tribal populations from south India and observed that tribal groups stand apart from caste populations and religious groups.

It has been observed on the basis of various studies that caste group is invariably clustered with the scheduled caste and the community, while the scheduled tribe/tribe is distinct from all. An explanation of this that the scheduled castes may have in them a substantial contribution of gene flow from the higher castes in past generations (Majumdar, 1965).

The distribution of major ethnic components may be present in the proportions similar to those observed in caste groups as the groups forming the communities in one way or the other are the offshoot of the major Indian ethnic stock (mainly the groups based on *Varna* system) at different periods of time in Indian history. The scheduled tribes who represent mainly the Australoid or Mongoloid strain, are distinct from all the other groups subdivided by social ranking.

Clustering of the population groups of India subdivided by geographical proximity and social ranking on the basis of genetic distances done by Bhasin et al. (1994) has been shown in the dendrogram presented in figure 16. It has shown three main clusters : first consisting of the north and west zones, the second consisting of the east zone and the third consisting of the North and South zone. First cluster reveals a close relationship between caste, scheduled caste and community of North, West and south India. Since most of the scheduled caste groups and communities in India are heterogeneous and represent Causasoid components (except for those in Eastern India) in different proportions, their closeness with the higher groups especially caste groups, is not unwarranted. The scheduled caste groups of West India clustering with the scheduled tribes once again stress the fact that the channelization of gene flow between the two cannot be over looked. It has been observed from the dendrogram that all the population groups of Eastern India form a single cluster, irrespective of their division by social ranking. This is reasonably so, because Eastern is represented by people with Mongoloid ethnic strain from the north eastern region, caste groups of causasoid origin from the north-western region and tribals from the southern and south western regions. Therefore the clustering of the scheduled tribes of South India with those of Eastern India is not incidental. The historical evidence indicates a very strong, viable and close contact between the people of the Eastern and South India. Further, it has been observed that the scheduled tribes of East India are having predominantly Austraoids and Mongoloids affinities in varying degrees; South Indian tribes are also predominantly Australoid and have admixture with Caucasoids.

The scheduled tribes of North India clustering with the scheduled caste of South India may be attributed to the fact that scheduled tribes of the North may still be harbouring the remanent of Caucasoid strain in them through their early contact in North India.

Kshatriya and Kapoor (1986) reported that the gene differentiation in the population groups of India is very small, thereby indicating that inter group variations are smaller than intragroup.

To sum up the tribes in different regions of

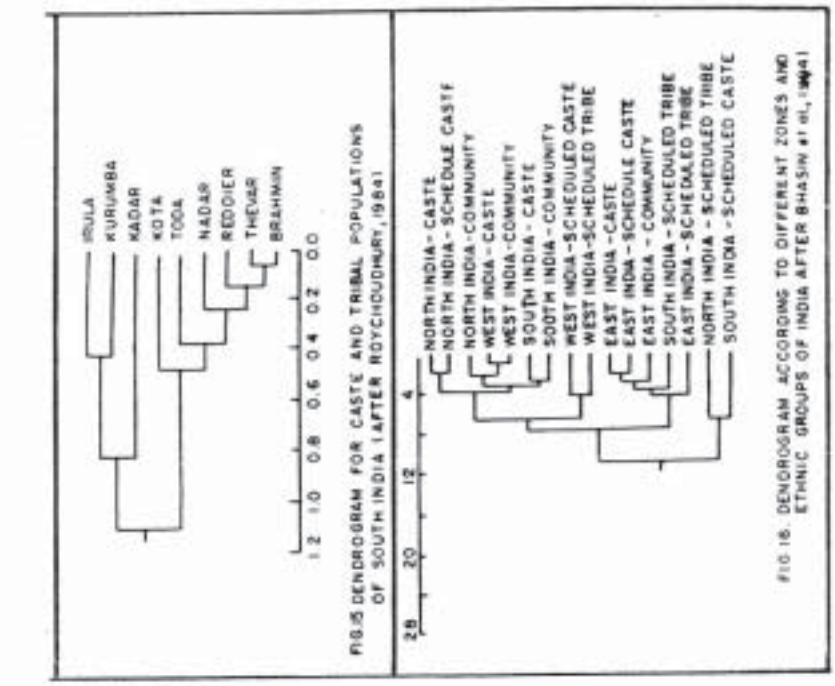


FIG 15 DENDROGRAM FOR CASTE AND TRIBAL POPULATIONS OF SOUTH INDIA (AFTER ROYCHOUDHURY, 1984)

FIG 16. DENDROGRAM ACCORDING TO DIFFERENT ZONES AND ETHNIC GROUPS OF INDIA AFTER BHASIN et al., 1994)

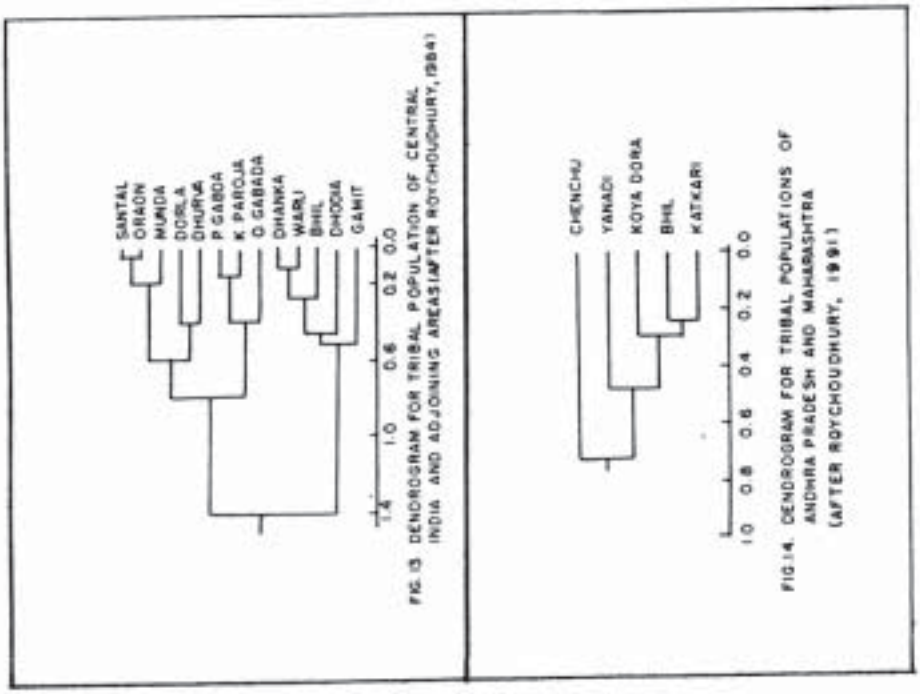


FIG 13 DENDROGRAM FOR TRIBAL POPULATION OF CENTRAL INDIA AND ADJOINING AREAS (AFTER ROYCHOUDHURY, 1984)

FIG 14. DENDROGRAM FOR TRIBAL POPULATIONS OF ANDHRA PRADESH AND MAHARASHTRA (AFTER ROYCHOUDHURY, 1991)

India are in general, genetically different from neighbouring caste populations.

This result indicate that inspite of their geographical proximity with caste population, the tribes remain isolated in most of the regions with reference to historical, socio-cultural and genetic perspectives. Again the tribes living in different regions are not genetically similar. Their genetic differentiation is influenced more by geographic proximity than by other factors. The tribes who are closed geographically have small genetic distances than those living apart. For example, the tribes in Bihar and Orissa are genetically closer to each other than they are to the tribes in Gujarat. The genetic distance between tribes is correlated more with geographic countinuity than with the linguistic affinity implying that exchange of genes occurs more often between neighbouring tribes than between tribes of same language groups living at a distance.

Finally it can be concluded on the basis of various genetic studies that the genetic diversity among caste and tribal populations do reflect differences at individual locus.

ACKNOWLEDGEMENTS

The author is grateful to Prof. K.C. Malhotra and Prof. A. Basu, Indian Statistical institute, Calcutta, Prof. A.K. Roychoudhury, Bose Institute, Calcutta and Prof. M.K. Bhasin, Department of Anthropology, University of Delhi for permitting to use their published data.

KEYWORDS Genetic Polymorphism, Genetic Variation, Ethnic Groups, India.

ABSTRACT Indian population offer a good material for genetical and anthropological studies because of their diversities. The first broad grouping of Indian populations is that into tribes and castes. Collecting gene frequency data from the literature, an attempt has been made to study the magnitude of genetic affinity among caste and tribal populations of various regions of India by genetic distance analysis. It has been observed that tribes in different regions are in general genetically different from neighbouring caste populations and it is further collaborated by ethno history and socio-cultural perspectives.

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