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Genetic Studies in Five Endogamous Populations of North Bihar

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ABSTRACT Five caste populations (Bania, Bhumihar, Dusadh, Kurmi and Chamar) from Purnia zone of North Bihar were studied for the ABO blood groups, the Rh blood groups, PTC tasting ability and red-green colour blindness. All five castes have high frequency of the B group. It has been concluded that correlation between ethnic relationship and serological similarities is not close. Genetic distance analysis showed the existence of a clear distance pattern. Bania and Dusadha as well as Bhumihars and Kurmis are found in different sub-clusters forming one coherent cluster, whereas Chamars are deviating obviously form this cluster. These analysis reflect the social differentiation of the five caste groups and substantiate the importance of endogamy for emergence and maintenance of genetic diversity in man.

INTRODUCTION

Scientists are of view that all men living today are derived from a common stock. Depending upon variation and similarity with regard to physical features, mankind has been divided into certain smaller groups called races. Races have been defined as ''populations which differ in gene frequencies'' and with this definition races must exist in human species as they do in most organisms (Smith, 1989).

The people of the Indian subcontinent have been divided into a large number of endogamous groups due to linguistic and cultural differences. In the last decades many genetic studies have been carried out on Indian population groups, which showed a considerable variability among them (For details *see* Bhasin et. al., 1992, 1994). One of the Indian regions, for which up to now only very few genetic data are available is North Bihar which is inhabited by a variety of populations. In order to assess their genetic relationship, five endogamous populations of this region were studied.

MATERIAL AND METHODS

Populations selected for the present work were Bania (190), Dusadh (222), Bhumihar (209), Kurmi (298) and Chamar (368). The data were collected from door to door survey from a sample randomly selected from the populations living in different villages of the Purnia division. The subjects were adults (over 18 years of age). The frequency of four genetical traits (the ABO blood groups, the Rh blood groups, PTC tasting ability and red-green colour blindness) with monogenic inheritance were estimated. The standard methodology was followed for the estimation of specific phenotypes as given below :

The allele frequencies were calculated according to Mourant et al. (1976) and genetic distance was calculated according to Nei (1972). Chi-square values were calculated by using Woolf's 'G' table (1957).

The tests are done for ABO blood groups–by slide agglutination method using antisera-A and-B; Rh blood groups–by slide agglutination method using antiserum-Rh(D); PTC tasting ability–by using method of grade dilution as

suggested Harris and Kalmus (1949) and Red-green colour blindness–using Ishihara (1960) colour plates.

RESULTS AND DISCUSSION

In all the five population studied here the group B is most prevalent (Table 1). Next common group among them is 0. The group AB is least frequent. The higher frequency of *B* allele is found in the Central East Asia with a maximum of 25-30% in the Himalyan region (Smith, 1989). Higher frequency of *B* than *A* allele of the ABO system is observed in majority of the Indian population. The people of the Gangetic plain show predominance of *B* over *A* (Roychoudhury, 1983).

The Chamar and Dusadh belong to scheduled castes. While Kurmi and Bania are backward class and Bhumiar is upper caste. The serological similarity in these castes supports the Lundman's view (1948) who pointed out that on the basis of the ABO gene distribution of world "The correlation between racial relationship and serological similarity is not very close". Central Mongoloids and Hindus physically so utterly unlike, exhibit practically the same serological pattern (Ramana Rao, 1977). Similar finding has been reported by Pandey et al. (1993) in case of Oraons, which although being socially and physically different from upper castes (Brahmins, Rajputs and Kayasthas) showed serological similarity with them. The same thing can be said about the serological similarity among the surveyed castes in the present investigation.

The incidence of the *O* allele is over 50% in all the groups, being highest in Chamar (59%) and lowest in Bania (51%). The frequency of the *A* allele is highest in Dusadh and lowest in Kurmi. The allele *B* manifests highest frequency in Kurmi and lowest in Chamar.

The Rh negative incidence is highest among Bhumihar (1.91%) and lowest in Chamar (0.27%) while in Bhumihar it is intermediate (1.57%). The frequency of the dominant *(D)* and recessive *(d)* alleles showed a different pattern of their distribution in all of them (Table 2).

The total frequency of the taste blinds was found in Dusadh (30.63%) and lowest in Chamar (18.75%). The distribution of PTC tasters among the castes of the present investigation was bimodal. The antimode in them lies between solution numbers 5 and 6. The frequency of the *t* allele in all these populations is higher than that of the *T* allele. The high frequency of the non-taster allele has been reported by other workers in different castes (Das, 1958; Tripathy, 1969; Sharma, 1976).

From table 1 it is quite clear that Dusadhs exhibit the highest frequency of the colour

Table 1 : Distribution of the ABO blood groups, Rh blood groups, PTC tasting ability and colour blindness in the five endogamous populations of North Bihar (Figures in paranthesis are %)

Population	*ABO blood groups*				*Rh-*	*PTC taste blinds*	*Red-green colour blind*
	A	*B*	*AB*	*O*			
Bania	36 (18.94)	70 (36.84)	28 (14.73)	56 (29.47)	3 (1.57)	58 (30.52)	5 (2.63)
Dusadh	57 (25.67)	79 (35.58)	22 (9.90)	64 (28.82)	3 (1.35)	68 (30.63)	5 (4.50)
Bhumihar	42 (20.09)	78 (37.32)	18 (8.61)	71 (33.97)	4 (1.91)	49 (23.44)	2 (0.95)
Kurmi	40 (13.42)	136 (45.63)	21 (7.04)	101 (33.89)	4 (1.34)	74 (24.83)	1 (0.33)
Chamar	80 (21.73)	150 (40.76)	15 (4.07)	123 33.42)	1 (0.27)	69 (18.75)	8 (2.17)

Table 2 : Allelic frequencies in the five endogamous populations of North Bihar

Population	*ABO*			*Rh*		*PTC*		*Colour blindness*	
	A	*B*	*O*	*D*	*d*	*T*	*t*	*C*	*c*
Bania	0.182	0.299	0.518	0.874	0.126	0.447	0.552	0.973	0.026
Dusadh	0.197	0.262	0.539	0.884	0.116	0.446	0.553	0.955	0.045
Bhumihar	0.155	0.264	0.580	0.862	0.138	0.515	0.484	0.990	0.009
Kurmi	0.108	0.311	0.580	0.884	0.116	0.501	0.498	0.996	0.003
Chamar	0.140	0.260	0.598	0.948	0.052	0.566	0.433	0.978	0.021

blinds (4.50%) and Kurmi the lowest (0.33%). These findings are in conformity with data on different Indian population.

From the foregoing discussion it can be concluded that genetic heterogeneity exists among the five population groups. It can be assumed that this heterogeneity is caused by a different microevolutionary process in these populations, in which factors like genetic drift might have playetl an important role. These genetic differences could be preserved because of the endogamous pattern of all the five caste groups under study, and by which gene flow among them could not take place, at least to any considerable extent (Walter et al., 1993). Thus one can regard the social organisation of these population groups from each other as a mian factor for their genetic isolation and hence for the marked genetic heterogeneity among them.

Statistical Analysis

The chi-square values for inter-group differences among the five population groups of North Bihar are given in table 3. Statistically,

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Dusadh	4.09			
Bhumihar	3.96	2.67		
Kurmi	11.83[1]	15.74[1]	5.74	
Chamar	18.73[1]	10.03[1]	5.16	10.06[1]

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Table 4 : Estimates of Nei's measure of genetic distance (D) among five population groups of North Bihar

Population	*Bania*	*Dusadh*	*Bhumihar*	*Kurmi*
Dusadh	0.0003			
Bhumihar	0.0030	0.0031		
Kurmi	0.0029	0.0038	0.0010	
Chamar	0.0085	0.0076	0.0035	0.0038

the chi-square values are insignificant between Bania and Dusadh, Bania and Bhumihar, Dusadh and Bhumihar and Bhumihar and Kurmi, while they are significant between the rest of the population groups surveyed.

Genetical Distance

The genetic distances between the present populations are shown in table 4 and figure 1. From dendrogram show in figure 1 it is quite clear that–

(i) There are two clusters - one comprising Bania, Dusadh, Bhumihar and Kurmi and the other comprising Chamar.

(ii) Chamar seperates from other castes at an early stage of microevolution.

(iii) Bania and Dusadh form one sub-cluster and Bhumihar and Kurmi the other. Bania and Dusadh show the smallest genetic distance and are thus found in one sub-cluster. The other one is formed by Bhumihar and Kurmi, who are comparatively distant from each other. There are no indications of genetic contact between them, though they speak the same language. Hence one

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