INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

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BIOGENETICAL STATUS OF MIGRANT SANTAL AND LOHRA OF PURNIA DISTRICT OF BIHAR, INDIA

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ABSTRACT
Bio-genetical status of migrant Santals and Lohras of Purnia district was studied using parameters like ABO and Rh blood groups, PTC taste ability, colour blindness, sickle cell anaemia and G- 6PD deficiency. The phenotypic and gene frequencies show wide differences in these two populations. Blood group B was found highest in Santals while blood group A was dominant in Lohras. It may be concluded that the changed gene frequencies in these two populations is due to evolutionary force like selection, mutation, genetic drift, and temporal variation. However, they retain their separate entities by practicing endogamy.

KEY WORDS: Bio-genetical status, Migrant Tribal population, Genetic drift, Temporal variation, Endogamy.

INTRODUCTION

Human populations live in clusters over wide geographical regions and show wide differences in socio-cultural attributes. The biology of a population is governed by a complex interaction between environmental and genetical factors. The genetic constitution of a population in interaction with environment of eco- niches produces great deal of variation among different population inhabiting the same or diverse habitats. The environmental factors of habitats in association with the micro-evolutionary forces ultimately influence the biological structure of the human populations.

Tribal populations of Koshi zone are migrants of Chotanagpur plateau (Jharkhand). These populations are under the influence of both intrinsic factors and of alien or exogenous factors in different geographical regions of their distribution. Keeping these facts in mind the present work was undertaken which deals with the biogenetical status of Santals and Lohras (using genetic traits – ABO and Rh blood groups, PTC taste ability, Colour blindness, Sickle cell anaemia and G- 6PD deficiency) in the changed ecological as well as socio-cultural condition.

METHODOLOGY

Data on various genetical parameters were collected from populations of Santal and Lohra residing in different villages of Purnia district. In no case two persons belonging to same family were subjected to test the traits.

A) The standard methodology was followed for the detection of ABO blood groups by slide agglutination method using ant-A and anti-B and Rh blood groups by slide agglutination method using anti-D.

B) Phenyl thio carbamide (PTC) taste ability was studied using method of Harris and Kalmus (1949a) and red – green colour blindness was detected by using Ishihara (1959) Colour plates.

C) Testing of sickling was done on spot by using freshly prepared 2% solution of sodium metabisulphite ($Na_2S_2O_5$).

D) Glucose –6 Phosphate dehydrogenase deficiency was detected with Brilliant Crystal Blue Dye test of Motulsky and Campbell – Kranel (1961).

RESULTS AND DISCUSSION

ABO blood groups – Blood groups are useful genetical markers and excellent traits of population genetic studies. The frequency of blood group in a population although a very stable characteristic, is affected by geographical isolation, temporal variation, and genetic drift Bittles and Smith, 1991; Pandey *et al*., 1993a). In the present population blood group A was found highest in Lohra and blood group B was found in Santal (Table – 1). In Lohra next dominating group was B followed by O and AB (A> B> O> AB) while in Santal next dominating group was A followed by O and AB (B> A> O> AB). Both populations exhibited highest frequency of gene r followed by q and gene p (r>q>p). Highest frequency of blood groups A and B has been reported in other local populations of Koshi zone (Pandey *et al*., 1993b, 1995 and, 2000). According to Lundman (1948) the correlation between varied relationship and serological similarity is not very close. Central Mongoloids and Hindus who are physically so utterly unlike, exhibit practically the same serological pattern (Rao, 1977). Such findings have been reported by Pandey *et al*.,1999 in case of Oraons, Brahmins and Mushars of Purnia district which differ physically as well as culturally but show same degree of serological pattern.

The present population of Santal manifested highest frequency of blood group B as reported in Santals of Jamshedpur (Pandey *et al*., 2003). If the dispersal distance is very short the mates borne are close to each other (Smith, 1989). The similarity between blood groups of Santals of Purnia district and Jamshedpur (Jharkhand) might be due to short dispersal distance. Further it has been reported by Race and Sanger (1975) that isolated migrants raised the ABO distribution of their place of origin for several centuries rather than conforming to that of surrounding populations. It has been known for some time that gypsies of Hindu origin, who have lived in

Hungary for several hundred years have modern Hindu distribution of ABO blood groups (Boyd, 1963). In general, the higher incidence of B than A gene is characteristic of the People of Indian sub-continent (Mourant *et al*., 1976; Roy Choudhary, 1983). Higher frequency of B than A gene of ABO system is observed in majority of Indian populations. It has been reported that the Gangetic plain and most tribes in Bihar, Odisha and Madhya Pradesh show pre dominance of B over gene A (Roy Choudhury, 1983). The present study reveals higher frequency blood group A in Lohra which might be due to geographical isolation, genetic drift and temporal variation. Sharma *et al*., have reported higher frequency of blood group O in Kond tribes while in other studies blood group has been reported in Kond tribes of Odisha which is due to geographical isolation inspite of common ancestary. Such variation in blood group of Oraons and Mundas of Koshi zone has been reported by Pandey *et al*., 1993a, 1999).

Rh factor – Rh is a complex system limited to red cells. In the present study the frequency of Rh negative was found to be 0.65% in Santals and 0.4% in Lohras(Table -1). Pandey *et al.* (2003) have reported frequency of Rh negative from 0% to 8.57% in the local populations of Koshi zone. Among Indian populations, the frequency of allele D averages around 80.3% (Bhasin *et al*.,1994). It is highest among Scheduled tribes (86%) as compared to other ethnic groups. The frequency of allele D in the present populations was found to be 32.8% in Santals and 1%in Lohras (Table – 2).

TABLE–1.Distribution (in %) of ABO, Rh blood groups, PTC and Colour blindness in two tribal populations

Populations	N	A	B	A	O	Rh^-	PTC taster	Red-green colour blind
Santal	350	27.42	40.32	12.90	19.35	0.65	33.87	1.94
Lohra	125	36.80	27.20	12.0	24.0	0.4	79.20	4.0

TABLE – 2. Allelic frequencies of different genetic markers in two tribal populations

Populations	ABO			Rh		PTC		Colour blindness	
	A	B	O	D	d	T	t	C	c
Santal	0.229	0.319	0.452	0.328	0.672	0.418	0.528	0.861	0.139
Lohra	0.280	0.195	0.514	1.00	0.00	0.543	0.456	0.800	0.200

PTC taste sensitivity – Taste sensitivity to PTC is well established as population genetic marker. Human individuals on the basis of their ability to taste PTC have been classified as tasters and non tasters. In the present study the frequency of taster was 33.87% in Santals and 79.20% in Lohras. The frequency of allele T among Indian population is 45.7% (Bhasin *et al*., 1994). In the present study the frequency of allele T was found to be 41.8% in Santals and 54.39% in Lohras. In general frequency of allele T is high among population groups with Mongoloid affinities from the Himalayan region but lower from the Mongoloid populations from the East and Southeast Asia and lowest among Scheduled tribes. An attempt was made to know relationship of taster with habits of betel chewing, smoking and drinking alcohol. However, no relationship was found with the ability of PTC tasters and these habits.

Colour blindness – The frequency of colour blindness among Indian population on average is 3.6% which varies from complete absence to 2.31%. The frequency of colour blindness in the present studied population is 1.94% in Santals and 4.0% in Lohras respectively (Table–1). Pandey et al., (2003) have reported frequency of colour blindness 1.55% in Santal populations of Jharkhand. Generally speaking the frequency of colour vision defects in the tribal population of India is low. Most of the available Indian data on this trait support the hypothesis by Post (1962) and Pickford (1963) wherein the elimination of disadvantageous gene for colour blindness has been attributed to the operation of natural selection. In conclusion, it may be called that the observed low frequency of colour blindness in the present studied population might be due to natural selection which however awaits further confirmation.

Sickle cell anaemia – Sickle cell anaemia is a condition in which shape of the R.B.Cs. become sickle cell like as a result of which oxygen carrying capacity is reduced. It is one of the most widely studied and interesting human haemoglobin mutants. Among Indian population the frequency of sickle cell trait is 3.1% (varies from complete absence to 41.0%). It is present in high frequency among Scheduled tribes (5.4%) as compared to other ethnic groups (Bhasin *et al*., 1994). In the present investigation the frequency of sickle cell anaemia was found to be 0.93% in Santals and 0.90% in Lohras (Table – 3). The presence of this trait in the present studied population may be admixture with other populations. These populations work as labourers in different parts of the country. Such instances of prevalence of sickle trait in Parsis of Bombay and Assamese population due to the admixture with other populations (Undevia *et al*., 1972; Flatz *et al*., 1972).

TABLE – 3. Frequency of sicklers and G- 6PD deficiency in two tribal populations

Populations	Number	Sicklers	G-6PD deficient
Santal	214	2 (0.93%)	1 (0.46%)
Lohra	111	1 (0.90%)	0 (0%)

Glucose – 6PD deficiency – Deficiency of Glucose – 6 PD deficiency is a common metabolic disorder of red cells and its prevalence varies widely from place to place and in various communities. The genetically determined

deficiency of G6-PD deficiency confers relative protection against the human parasite, *Plasmodium falciparum* . Red cell G-6PD deficiency is wide spread in India. The frequency of G– 6PD deficiency is 4.5% (varies from complete absence to 27.1%) among the Indian population and is quite high among Scheduled tribes as compared to the other ethnic groups (Bhasin *et al*., 1994). In the present study no case of G6 – 6PD deficiency was found in Lohras while in Santals its percentage was 0.46 (Table – 3). The frequency of G- PD deficiency in the Oraons of Gumla has been found to be very low (0.4%, Saha *et al.*, 1988). Simon *et al*. (1980) have reported that most of the upper castes show low or even no deficiency of G-6PD while most of the lower castes and tribes show higher percentage. Besides, thus it is due to ecological conditions in which population is living responsible for the striking variations in their G -6PD deficiency. Purnia is located at a height of nearly 37 meters above the sea level and the zone has many low land areas where water logging takes place as well as there is abundance of marshy and swampy places, which are favourable habitats of mosquitoes. Earlier this area was badly affected by malaria; however, now-a-days its prevalence is quite low. Thus in these circumstances the 0.46% of G6 – 6PD deficiency in Santals recorded in the present study may be correlated with the environmental conditions which supports the findings of Saha *et al*. (1988).

The study clearly revealed genetic affinities between two populations. However, changed gene frequencies among these populations might be due to evolutionary forces like genetic drift, mutation, temporal variation and selection. These populations retain their separate entities by practicing endogamy. However, to know intra and inter group affinities more genetical parameters like red cell enzyme polymorphisms should be studied.

ACKNOWLEDGEMENT

The financial support received from the Indian Council of Medical Research, New Delhi for the project entitled Biological Status of Tribal Groups of Bihar is duly acknowledged.

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