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The Distribution of A1A2BO and RH(D) Blood Groups in the Buksa – A Primitive Tribe of Uttarakhand, North India

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ABSTRACT The present paper reports original blood grouping data on the A1A2BO and RH(D) blood groups in the Buksa – a little known primitive tribal population of India inhabiting districts of Dehradun, Udham Singh Nagar and Nainital in Uttarakhand state located in the Central Himalayas in North India. In the three regional Buksa samples studied here the incidence of the A1 + A2 blood groups was found to be consistently higher than that of B blood group. As for the allele frequencies, compared to *ABO*B*, *ABO*A1* frequency was noted higher in all the three Buksa groups. Infrequent allele *ABO*A2* was found lacking in the sample tested from Udham Singh Nagar district but was present in the Buksa of both Dehradun and Nainital districts, albeit in low proportions. As for the RH(D) blood groups in the present Buksa material, the incidence of the RH(D)– phenotype was found very low indeed (range 1.05 - 1.83%) and *RH*d* allele frequency was also noted in a rather low range (0.102 - 0.136). Thus, the present serological investigation has helped in genetically characterizing the Buksa tribe inhabiting three different districts of Uttarakhand.

INTRODUCTION

Human blood, considered as a vital fluid for centuries, has come to occupy an important place in the study of human genetics as it is readily available tissue for investigating an array of discontinuous polymorphic serological, biochemical and DNA markers. The ABO and RH(D) blood groups are among the most important blood characters both clinically and anthropologically. The caste populations of Uttarakhand have been the subject of some detailed serological investigations (Tiwari 1954; Bird and Krishnaswami 1955; Tiwari and Bhasin 1968; Chahal et al. 1995; Gauniyal 2006; Pattanayak 2006). Similarly, tribal populations of the state viz., the Jaunsari, Tharu, Bhotia and Buksa have also been studied (Majumadar 1942; Tiwari 1952; Banerjee and Kumar 1953, Srivastava, 1965, Garg et al., 1981, Tiwari, 1984, Chahal et al. 1995, Patni and Yadav 2003).

The present genetic study was planned on the the Buksa, a primitive tribal group (PTG) inhabiting north Indian hill state of Uttarakhand on priority basis because of their dwindling numbers. Barring a couple of studies on PTC tasting ability and the ABO, MN and RH blood groups by Garg et al. (1977, 1981) and a report by Patni and Yadav (2003) on ABO and RH(D) blood groups among the Buksa of Dehradun district, no such genetic data are available on the Buksa of Udham Singh Nagar and Nainital districts. Thus, the aim of the present investigation is to provide blood group variation data on the Buksa tribe from all three districts of its habitation in Uttarakhand.

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MATERIAL AND METHODS

According to the Census of India (1991) the total population of the Buksa tribe was 32,890. The tribe is mainly concentrated in the Foothill area of Dehradun district (10,359) and the Terai area of Nainital district (20,180, including areas now falling in Udham Singh Nagar district created in 1995). For the present work, a total of 568 finger prick blood samples was collected at random from unrelated Buksa individuals of both sexes from Dehradun (218), Udham Singh Nagar (159) and Nainital (191) districts of Uttarakhand, a North Indian hill state located in the Central Himalayas. The samples were collected in EDTA.K_2 vials and personally transported in wet ice to Patiala where these were tested for two serological markers viz., the A1A2BO and RH(D) blood groups by the tube method following standard serological techniques as described in Bhasin and Chahal (1996). Allele frequencies were

calculated after.Yasuda (1984) and Mourant et al. (1976) for A1A2BO and RH(D) systems, respectively. In A1A2BO system the deviations between the observed and expected phenotype numbers were tested by the goodness of fit Chi square test.

RESULTS AND DISCUSSION

The A1A2BO Blood Group System

The distribution of phenotypes and alleles of the A1A2BO system in the Buksa tribe in the three studied districts of Uttarakhand is given in Table 1. The goodness of fit Chi square values (range 0.3710 - 4.4819) showed statistically non-significant differences between the observed and expected phenotype numbers, demonstrating that the Buksa population in all the districts was in Hardy-Weinberg equilibrium for this genetic marker. In each of the Buksa sample, the frequency of A1 + A2 blood groups was higher than that of B. The combined value of the former phenotypes was noted rather high in the Buksa of two contiguous districts of Udham Singh Nagar (45.28%) and Nainital (39.27%) but the latter phenotype was uniformly present in the three districts (range 23.04 – 25.69%). As for allele frequencies, *ABO*A1* was present predominantly (range 0.2116-0.3439) in comparison to *ABO*B* (range 0.1713 – 2055). It may be noted that the trend in allele frequencies noted in the present Buksa is similar to that reported in the Buksa of Dehradun district by Garg et al. (1981) and Patni and Yadav (2003) but opposite to that of the several caste populations of the Central and Western Himalayan region in which the frequency of *ABO*B* was found higher than *ABO*A* (Bhasin et al. 1992; Mandal, 1992; Choudhary and Malik 1997; Bhasin and Walter 2001; Mourant et al. 1976).

Tiwari (1972) opined that "there is a definite patterning in the distribution of ABO blood groups in the populations of Himalaya". In this vast hilly tract of India, running from the Jammu and Kashmir in the west to Arunachal Pradesh in the east, the frequency of group B is higher than that of group A among caste groups inhabiting the foot-hills or southern region of Himalayas. Populations residing in the zone adjoining Tibet in the northern region of Himalayas also display a similar picture of the ABO distribution. Sandwiched between these two almost parallel stretch-

Table 1: The distribution of A1A2BO blood groups in the Buksa tribe of Uttarakhand

District	*n*	*Phenotypes*						*Allele Frequencies*				χ^2	
			O	*A1*	*A2*	*B*	*A1B*	*A2B*	*ABO*A1*	*ABO*A2*	*ABO*B*	*ABO*O*	
Dehradun	218	Obs.	74	63	4	56	20	1	0.2116	0.0154	0.1946	0.5784	0.3907
				(33.94)	(28.90)	(1.83)	(25.69)	(9.17)	(0.46)				(df 5)
		Exp.	72.92	64.55	3.92	57.33	17.96	1.26					
Udham Singh Nagar	159	Obs.	30	72	-	40	16	1	0.3439	-	0.2055	0.4506	2.6624
			(18.87)	(45.28)	-	(25.16)	(10.06)	(0.63)					(df 4)
		Exp.	32.28	68.08		36.16	22.48	-					
Nainital	191	Obs.	55	75	2	44	13	2	0.2709	0.0099	0.1713	0.5479	4.5021
			28.80	(39.27)	(1.05)	(23.04)	(6.81)	(1.05)					(df 5)
		Exp.	57.34	71.56	2.08	41.45	17.22	0.65					

Obs. =Observed, Exp. =Expected

Table 2: The distribution of RH(D) blood groups in the Buksa tribe of Uttarakhand

District	*n*	*Phenotypes*		*Allele Frequencies*	
		RH(D)+	*RH(D)-*	*RH*D*	*RH*d*
Dehradun	218	214	4 (1.83)	0.8645	0.1355
Udham Singh Nagar	159	157	2 (1.26)	0.8878	0.1122
Nainital	191	189	2 (1.05)	0.8977	0.1023

Figures in parentheses are percentages.

es of high group B territories there runs a narrow belt of area characterized more often by preponderance of group A over group B from Western Himalayas to Eastern Himalayas. Viewed against this background, the variation observed in the A1A2BO system in the present Buksa tribal material from Uttarakhand is in conformity with the Himalayan pattern. Uttarakhand is part of that middle tract of Himalayas where among caste and tribal populations the frequency of group A has been repeatedly shown to be consistently higher than group B (Majumdar and Bahadur 1952; Banerjee and Kumar 1953 Mathews 1959; Tiwari and Bhasin 1968; Garg et al. 1981; Patni and Yadav 2003).

The high frequency of allele *ABO*A* (*ABO*A1 + ABO*A2*) compared to allele *ABO*B* recorded among population groups in Western and Central Himalayas may be explained by their contacts with Central Asiatic populations, whereas populations in which the frequency of *ABO*B* is higher compared to that of *ABO*A* may have had contacts with the Tibetans. Furthermore, population groups of the Eastern Himalayas, where the frequency of allele *ABO*A* is quite high compared to allele *ABO*B*, may have had contacts with populations belonging to the Northern Mongoloid stock (Bhasin and Walter 2001). However, as the communication facilities are meager and the different population groups living in the Himalayas are rather isolated from one another, factors like drift and natural selection may also have contributed to their present genetic composition.

The RH(D) Blood Group System

Table 2 shows the results of the present Buksa population groups for the RH(D) blood groups. The RH(D)- phenotype was found with a frequency ranging from 1.05 to 1.83% in the Buksa of Dehradun, Udham Singh Nagar and Nainital districts. As for allele frequencies, the incidence of *RH*d* varied in a rather low range (0.1023 - 0.1355). The incidence of the phenotype and allele was reported somewhat higher in two earlier samples of Buksa reported from Dehradun district (4.17% and 0.2141, respectively, Garg et al. 1981; 3.29% and 0.1813, respectively, Patni and Yadav 2003). In different Bhotia tribal groups reported from Garhwal in Uttarakhand almost complete absence of RH(D)- and *RH*d* has been reported (Tiwari 1984, Chahal et al. 1995). On the other hand, in the caste populations of the state comparatively much higher incidence of of the phenotype and allele was reported (Tiwari and Bhasin 1968 Chahal et al. 1995). Thus the Bhutia tribe of Uttarakhand is characterized by rather low variation in the RH(D) blood group system, a feature typical of the Mongoloid populations inhabiting adjoining Tibet (China) (Mourant et al. 1976), suggesting admixture between them.

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