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Human Population Genetics II. Distribution of ABO Blood Groups in Varanasi and Sultanpur, Uttar Pradesh

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ABSTRACT Data are presented on the phenotypes and allele frequency distribution of the ABO blood groups in 2 random samples each derived from Varanasi and Sultanpur. The application of Hardy-Weinberg Law to the observed data demonstrated perfect genetic equilibrium in all the 4 sampled studied. However, the χ^2-test demostrated signficant heterogeneity between the random samples of each area.

INTRODUCTION

Population genetics is an important field of investigations which is basically concerned with the study of mechanisms by which genetic changes are affected in a population. Genetic variations originate in a population due to mutation, chromosomal variability and recombination, on which various evolutionary forces such as selection, genetic drift and migration operate to bring about changes in its genetic constitution. Population genetics of a large number of animal and plant species has been studied in detail which have provided important information on the mechanism of evolution. Studies on human population genetics have also been undertaken by several investigators and interesting observations concerning mutation, selection, genetic drift, inbreeding, migration, protein polymorphism and associations between genetic markers and diseases in different regions of the world have been reported (Morris, 1973; Bhasin et al., 1992; Bhasin, 1994). The extent of genetic diversity in blood groups and biochemical genetic markers in various urban and tribal populations of India has been studied (Bhasin et al., 1992) but in view of vast number of endogamous groups in each state, the data are not sufficient to explain the dynamics of maintenance of these microevolutionary changes in human population in India (Chahal and Papiha, 1981).

Recently, we have initiated human population genetical work in Varanasi and adjacent areas to study the genetic composition of human populations with respect to certain genetic traits (Lata and Singh, 1995). In this communication, we report here our data on the distribution of the ABO blood groups in 4 random samples from Varanasi and Sultanpur situated in eastern Uttar Pradesh. As far as we know, the Sultanpur population has not been studied earlier for the distribution of the ABO blood groups.

SUBJECTS, MATERIALS AND METHODS

The data for the ABO system were collected in two random samples each of Varanasi as well as Sultanpur. In Varanasi, sample I consists of 863 donors tested for their blood groups in Lion's Vishal Blood Bank and sample II consists of 459 donors tested for their blood groups in Hindu Seva Sadan Hospital. In Sultanpur, finger prick blood samples from a total of 117 staff members of Kamla Nehru Insititue of Physics and Social Sciences were tested for ABO blood groups by using anti-A and anti-B sera in sample I and the date were collected from pathology laboratories of the city for sample II.

The allele frequencies were calculated using the Bernstein's correction formulae and the significance of deviations from genetic equilibrium was tested by applying Hardy-Weinberg Law and χ^2 test according to the procedure given by Strickberger (Strickberger, 1985).

RESULTS AND DISCUSSION

The distribution of the ABO blood groups in two random samples from Varanasi (Table 1) showed that they were in perfect genetic equilibrium as there was no significant departure from Hardy-Weinberg equilibrium in either case ($P > 0.05$; $df = 1$). In both the samples, the *O* allele was the most frequent and the *A* allele least frequent. The distribution of the ABO blood groups and allele frequencies in Varanasi district has been studied earlier for Hindu and Muslim soldiers, donors and controls (Mathew, 1959; Jolly et al., 1960; Srivastava and Shukla, 1963; Sehgal et al., 1966; Singh and Ojha, 1967). In these reports, the frequency of *O* allele ranged from 41.74 to 58.34%, *B* allele from 23.52 to 30.92% and *A* allele from 14.62 to 27.38%. The frequency of all the three alleles in two random samples of Varanasi observed during the present study falls within the range reported earlier in Varanasi populations. Thus the allele frequency in the present random samples is close to that reported earlier for different castes.

The distribution of the ABO blood groups in two random samples investigated from Sultanpur (Table 1) was also found to be in genetic equilibrium. The frequency of the *O* allele is highest in both these samples as compared to the *A* and *B* alleles. The frequency of different alleles in sample I from Sultanpur is close to what has been found in Varanasi population. However, there were differences in the frequency of the *O* and *B* alleles between the two samples of Sultanpur and also between the sample II of Sultanpur and Varanasi samples. The differences observed in the distribution of the ABO blood groups between two random samples from Varanasi ($\chi^2 = 11.24$, $df = 3$, $P < 0.05$) as well as Sultanpur ($\chi^2 = 15.93$, $df = 3$, $P < 0.01$) may well be attributed to sampling errors (*i.e.* chance events).

Table 1: Distribution of the ABO blood groups in two samples from Varanasi and Sultanpur

Area/	*n*		*Phenotypes*				*Allele frequencies*			χ^2
Sample			*O*	*A*	*B*	*AB*	*A*	*B*	*O*	*(d.f. =1)*
Varanasi										
Sample I	863	Obs.	283	179	323	78	0.162	0.268	.570	0.21
		Exp.	280.59	181.85	325.62	75.02				
Sample II	459	Obs.	119	128	170	42	0.208	0.269	0.523	2.97
		Exp.	125.50	119.96	162.22	51.42				
Sultanpur										
Sample I	117	Obs.	38	26	38	15	0.193	0.259	0.548	1.72
		Exp.	35.14	29.10	41.05	11.70				
Sample II	100	Obs.	46	34	16	4	0.213	0.106	0.681	0.08
		Exp.	46.38	33.54	15.56	4.52				

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