

Blood Group Variation in Selected Caste Populations of Haryana

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ABSTRACT Data are presented on phenotypes and allele frequencies of the A_1A_2BO , MN and Rh(D) blood groups in seven selected endogamous caste populations of Haryana, a north-west Indian state. The distribution of each of these serological markers was found to be rather heterogeneous in the present caste material, albeit generally resembling that observed in various other populations inhabiting north-west India, especially the neighbouring state of Punjab.

INTRODUCTION

Studies on the distribution of various serological traits in the populations of the north-west Indian state of Haryana are limited as yet (Khurana, 1956; Malik et al., 1988; Kushwaha et al., 1990 a,b; Yadav and Gupta, 1992). The present investigation was therefore planned to fill this void on the genetic map of Haryana by providing original data on 3 serological markers viz., the A_1A_2BO , MN and Rh(D) blood groups among as many as 7 selected endogamous caste groups of Haryana viz., the Jat, Ahir, Ror, Saini, Kamboj, Kumhar and Chamar.

SUBJECTS, MATERIAL AND METHODS

Blood samples from a total of 1,417 healthy and not closely related individuals of both sexes, inhabiting the Kurukshetra (Jat, Ror, Saini, Chamar), Hisar (Jat, Ror), Jind (Jat), Mahendragarh (Jat, Ahir, Saini, Chamar), Ambala (Kamboj) and Sirsa (Kamboj, Kumhar, Chamar) districts of the Haryana state were collected. The subjects were invariably randomly se-

lected from the rural areas of these districts and were mostly school going children and employees of the respective schools. About 1 ml blood was drawn by finger prick in micro-centrifuge plastic vials containing potassium E.D.T.A as an anticoagulant. Collections were made in several batches from August 1990 to September 1991.

Samples were transported to Patiala in ice containers, where blood grouping tests were performed following the standard serological techniques and manufacturer's instructions. The allele frequencies for the A_1A_2BO system were calculated by the method of Yasuda (1984); those for the MN and Rh (D) systems were calculated by the gene counting method and the square root method, respectively (Mourant et al., 1976).

RESULTS AND DISCUSSION

The phenotype numbers, allele frequencies and goodness of fit χ^2 values for the 3 blood groups investigated among Haryana populations are presented in tables 1-3. Due to shortage of antisera, the batch of blood samples from Hisar district comprising almost entirely of the Ror caste subjects could not be tested for the MN blood groups.

The A_1A_2BO Blood Group System : Results presented in table show that each caste group was in Hardy-Weinberg equilibrium for this system. There was preponderance of the B allele (range 0.232 - 270) over the A allele (combined frequencies of the A_1 and A_2 alleles; range 0.134 - 0.255), the only exception being the Ror in which the A incidence (0.255) was slightly higher than the B incidence (0.246).

Table 1 : Distribution of the A_1A_2BO blood groups in various caste groups of Haryana

Caste group	n		A_1A_2BO phenotypes						A_1A_2BO allele frequencies				χ^2 (d.f. 5)
			O	A_1	A_2	B	A_1B	A_2B	A_1	A_2	B	O	
Jat	210	Obs.	72	39	4	71	19	5	0.148	0.016	0.255	0.581	2.870*
		Exp.	70.89	41.71	3.96	75.88	15.85	1.71					
Ahir	208	Obs.	69	35	10	79	12	3	0.121	0.040	0.262	0.577	0.600
		Exp.	69.25	34.10	9.93	77.17	13.19	4.36					
Ror	201	Obs.	53	44	17	62	23	2	0.180	0.075	0.246	0.499	6.035
		Exp.	50.05	48.05	16.18	61.51	17.80	7.42					
Saini	200	Obs.	59	37	12	75	13	4	0.135	0.053	0.268	0.544	0.758
		Exp.	59.19	35.88	12.10	72.68	14.47	5.68					
Kamboj	197	Obs.	65	34	4	69	20	5	0.146	0.017	0.270	0.567	4.245*
		Exp.	63.33	37.79	3.86	74.68	15.53	1.81					
Kumhar	201	Obs.	71	33	4	80	11	2	0.117	0.017	0.268	0.598	0.231*
		Exp.	71.88	31.68	4.15	78.96	12.61	1.83					
Chamar	200	Obs.	63	52	3	63	18	1	0.194	0.013	0.232	0.561	0.003**
		Exp.	62.94	52.07	2.95	62.83	18.00	1.21					

* d.f. 4 (calculated after pooling A_2B , A_1B phenotypes)**d.f. 3 (calculated after pooling A_2 , A_1 phenotypes, and A_2B , A_1B phenotypes)

The A_2 allele was present in each group, albeit in varying proportions (range 0.013-0.075).

The χ^2 test for inter-group comparisons revealed that the Ror were significantly different from the Jat ($\chi^2 = 13.322$, d.f. 5, $0.05 > p > 0.02$), Kamboj ($\chi^2 = 12.380$, d.f. 5, $0.05 > p > 0.02$), Kumhar ($\chi^2 = 18.749$, d.f. 5, $0.01 > p > 0.001$) and Chamar ($\chi^2 = 12.277$, d.f. 5, $0.05 > p > 0.02$). Similarly the Chamar differentiated themselves from the Ahir ($\chi^2 = 11.214$, d.f. 5, $0.05 > p > 0.02$) and Saini ($\chi^2 = 11.709$, d.f. 5, $0.05 > p > 0.02$). Furthermore, the overall distribution of this blood group system among the 7 caste populations of this study was found to be heterogeneous, showing statistically significant difference ($\chi^2 = 50.122$, d.f. 30, $0.02 > p > 0.01$).

Earlier reports on Haryana caste populations reveal that the frequency of the A allele in them varies from 0.068 in the Khatri to 0.276 in the Sunar (Kushwaha et al., 1990 b). The variability of this allele observed in the present caste populations (0.134-0.255) thus fits well within the range of the earlier studies. Also, the frequency of the B allele in Haryana populations was reported to vary from 0.185 in the Sunar to 0.387 in the Khatri. By compar-

ison, the present range (0.232 - 0.270) is relatively narrow. Similarly, the frequency of the A_1 allele in the caste populations investigated here (0.117 - 0.194) is not much different from that observed by Kushwaha et al. (1990a) in an earlier caste material from the state (0.136 - 0.156).

Besides Haryana, populations from the neighbouring regions of the state, especially those inhabiting Punjab (Bhasin et al., 1992) showed close resemblance in the A_1A_2BO allele frequencies with the present Haryana groups.

The MN Blood Group System : Barring Kumhar in which an excess of heterozygotes and a deficit of both the homozygotes had resulted in a significant deviation ($\chi^2 = 8.499$, d.f. 2, $0.02 > p > 0.01$), in the remaining groups the distribution of the MN phenotypes was found to be in genetic equilibrium. The frequency of the M allele was consistently higher (range 0.593-0.707) than N allele (range 0.293 - 0.407) in the 6 caste groups that could be investigated for this system (Table 2).

Inter-population comparisons for the MN blood group system revealed significant differences only between Ahir and Saini

Table 2: Distribution of the MN blood groups in various caste groups of Haryana

Caste group	n	MN phenotypes			MN allele frequencies		χ^2 (d.f. 2)	
		MM	MN	NN	M	N		
Jat	162	Obs.	76	71	15	0.688	0.312	0.074
		Exp.	76.68	69.55	15.77			
Ahir	208	Obs.	109	76	23	0.707	0.293	2.925
		Exp.	103.97	86.18	17.86			
Saini	200	Obs.	66	105	29	0.593	0.407	1.523
		Exp.	70.33	96.54	33.13			
Kamboj	196	Obs.	89	93	14	0.691	0.309	2.446
		Exp.	93.59	83.70	18.71			
Kumhar	201	Obs.	76	110	15	0.652	0.348	8.499*
		Exp.	85.45	91.21	24.34			
Chamar	70	Obs.	32	31	7	0.679	0.321	0.016
		Exp.	32.27	30.51	7.21			

* 0.02 > p > 0.01

($\chi^2=14.806$, d.f. 2, $p<0.001$) and between Ahir and Kumhar ($\chi^2=12.248$, d.f. 2, $0.01>p>0.001$). The overall distribution among the 6 caste groups investigated for this system was quite heterogeneous ($\chi^2=33.219$, d.f. 12, $p<0.001$).

A single investigation available for the distribution of the MN blood groups in Haryana populations (Kushwaha et al., 1990a) reported a rather narrow range for the M allele (0.639 - 0.745). By comparison, the present estimates fall in a much wider range (0.444 - 0.707). However, the overall distribution of this blood group system in the investigated populations from Haryana is similar to many other caste populations inhabiting north-west India, especially Punjab (Bhasin et al., 1992)

The Rh(D) Blood Group System: There was a great variability in the Rh(D) negative incidence in the present caste groups- it varied from as low as 5% to as high as 17.62% (Table 3). The value recorded in the Jat (17.62%) was indeed rather high as compared to the remainder (range 5 - 10.45%). This difference was also reflected in allele frequencies where a comparatively high value of the recessive allele *d* in the Jat (0.420) sets them apart from others (range 0.224 - 0.322).

For the Rh (D) blood groups, the Jat showed statistically significant differences with each

of the remaining caste groups - Ahir ($\chi^2 = 10.391$, d.f. 1, $0.01>p>0.001$), Ror ($\chi^2=6.651$, d.f. 1, $0.01>p>0.001$), Saini ($\chi^2=16.072$, d.f. 1, $p<0.001$), Kamboj ($\chi^2 = 11.455$, d.f. 1, $p<0.001$) and Kumhar ($\chi^2=4.358$, d.f. 1, $0.05>p>0.02$). Such differences were also observed between the Saini and Kumhar ($\chi^2 = 4.171$, d.f. 1, $0.05>p>0.02$). Considering all the seven caste groups together, there was appreciable difference, indicating heterogeneous distribution of this blood group system in them ($\chi^2=29.127$, d.f. 6, $p<0.001$).

In the earlier studies from Haryana (Kushwaha et al., 1990 a,b; Yadav and Gupta, 1992), the *d* allele incidence was found to vary from nil to as high as 0.381. Viewed against this background, the range of the allele frequencies observed in the present investigation (0.224 - 0.420) was comparatively high at both ends.

The variation recorded in the Rh (D) blood group system in present material from Haryana was essentially similar to that of populations of north-west Indian region in general and Punjab in particular (Bhasin et al., 1992).

In conclusion, this serological investigation demonstrates that there is appreciable variation in the distribution of each of the three blood groups examined [A_1A_2BO , MN,

Table 3: Distribution of the Rh(D) blood groups in various caste groups of Haryana

Caste group	n	Rh(D) phenotypes		Rh(D) allele frequencies	
		Rh(D)+	Rh(D)-	D	d
Jat	210	173	37 (17.62%)	0.580	0.420
Ahir	208	193	15 (7.21%)	0.732	0.268
Ror	201	183	18 (8.96%)	0.700	0.300
Saini	200	190	10 (5.00%)	0.776	0.224
Kamboj	197	184	13 (6.60%)	0.743	0.257
Kumhar	201	180	21 (10.45%)	0.678	0.322
Chamar	200	189	11 (5.50%)	0.765	0.235

Rh(D)] here among Haryana populations. Nonetheless, allele frequencies recorded were well within the north-west Indian ranges. The genetic heterogeneity such as evidenced by the Ror in the A_1A_2BO system and the Jat in the Rh(D) system may well be a true reflection of their diverse ethnic backgrounds or effect of some local selective pressures or both.

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REFERENCES

- Bhasin, M.K., Walter, H. and Danker-Hopfe, H. : *The Distribution of Genetical, Morphological and Behavioural Traits Among the Peoples of Indian Region*. Kamla-Raj Enterprises, Delhi (1992).
- Khurana, B.K. : ABO blood group investigation among the Jats of Rohtak (Punjab). *Man in India*, **36**: 224-227 (1956).
- Kushwaha, K.P.S., Chahal, S.M.S., Bansal, I.J.S., Chugh, O.P. and Sarojani : Sero-genetic variation in four caste populations of Haryana, India. *Hum. Hered.*, **40** : 262-266 (1990a).
- Kushwaha, K.P.S., Gaur, J.R., Sangwan, S.K., Yadav, A.S., Thukral, K., Kushwaha, B.P., Chopra, I.S., Chugh, O.P. and Chahal, S.M.S. : ABO and Rh(D) blood groups among 19 caste populations of Haryana. *Bionature*, **10**: 73-75 (1990b).
- Malik, D.V.S., Dhiman, S.R. and Bansal, I.J.S. : A study of some morphological, behavioural and genetical parameters among Jats of Haryana. *Bionature*, **8**: 136-140 (1988).
- Mourant, A.E., Kopec, A.C. and Domaniewska-Sobczak, K. : *The Distribution of the Human Blood Groups and Other Polymorphisms*. Oxford University Press, London, 2nd Edition (1976).
- Yadav, J.S. and Gupta, M.M: An anthropogenetic study of the Jats of Haryana, India. *J. Hum. Ecol.*, **3**: 147-148 (1992).

Bhasin, M.K., Walter, H. and Danker-Hopfe, H. : *The Dis-*