

Distribution of the Rhesus, P, Kell, Duffy and Lewis Blood Groups in Haryana

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ABSTRACT Baseline data are presented on polymorphisms of 5 blood group systems (Rhesus, P, Kell, Duffy and Lewis) investigated in four well defined endogamous caste groups viz. Jats, Rajputs, Gujjars and Ahirs, and a heterogeneous group "Others" inhabiting Haryana, a north-west Indian state. The distribution of haplotypes/alleles of these systems were in genetic equilibrium (except for Rhesus system in Rajputs) and their frequencies were well within the general ranges reported earlier for the neighbouring north Indian populations.

INTRODUCTION

The serological profile of the people of Haryana a north western Indian state is still incomplete, since the distributions of only ABO, Rh(D) and MN blood groups have been reported in its populations so far (Khurana, 1956; Malik et al., 1988; Kushwaha et al., 1990 a, b; Yadav and Gupta, 1992).

The present report provides baseline data on the distribution of Rhesus (C,c,D,E,e), P, Kell, Duffy and Lewis blood group systems in the populations of Haryana, a north-west Indian state located between 27.5° and 31° northern longitude and between 74.5° and 77.50° eastern longitude, with a total geographical area of 42,412 sq km. For this study four well defined endogamous caste groups of the state viz. Jats, Rajputs, Gujjars and Ahirs were sampled. Persons who did not fit into any of these groups were placed under the category "Others" which therefore is a heterogenous group.

MATERIAL AND METHODS

Material was collected at random from unrelated individuals of either sex from each sub-

ject about 0.5ml blood was drawn in EDTA tubes by finger pricking. Using standard serological techniques and following manufacturer's instructions, red cells were tested with anti-C, -c, -D, -E, -e for Rhesus (n=339), with anti-P₁ for the P system (n=300), with anti-K, -k for Kell system (n=163), with anti-Fy^a, -Fy^b for Duffy system (n=65), and with anti-Le^a and -Le^b for Lewis system (n=161). Antisera manufactured by Ortho Diagnostic Systems, New Jersey, USA were used throughout this work.

The haplotype/allele frequencies for Rhesus and Duffy systems were calculated using maximum likelihood method while those for other systems were calculated according to Mourant et al. (1976).

RESULTS AND DISCUSSION

The distribution of the phenotypes of Rhesus, P, Kell, Duffy and Lewis blood group systems are presented in table 1, and the corresponding haplotype/allele frequencies in table 2.

The Rhesus System

Out of the 18 possible phenotypes of the Rhesus (C, c, D, E, e) system, only 7 were detected in Jats, 8 in Ahirs and 10 each in Rajputs and Gujjars. In Rajputs, the phenotype CCDee occurred with highest frequency (57.1%) followed by CcDee (22.1%). In Gujjars and Ahirs, the reverse trend was seen. In Jats the frequencies of these two phenotypes were of the same order (32.7%).

Among the haplotypes, CDe showed the highest incidence ranging between 0.4429 (Gujjars) and 0.6267 (Rajputs). This was followed by cde which varied from 0.1087 in Guj-

Table 1 : Distribution of Rhesus, P, Kell, Duffy and Lewis blood groups in Haryana

Blood group/ phenotype	Jats		Rajputs		Gujjars		Ahirs		Others		Total	
	No. obs.	Frequency obs.	No. obs.	Frequency obs.	No. obs.	Frequency obs.	No. obs.	Frequency obs.	No. obs.	Frequency obs.	No. obs.	Frequency obs.
<i>Rhesus System</i>												
CCDEe	0	0.000	0	0.000	0	0.0000	0	0.000	1	0.015	1	0.003
CCDec	17	0.327	44	0.571	16	0.2970	25	0.278	25	0.379	127	0.375
CCddec	0	0.000	1	0.013	1	0.0185	0	0.000	0	0.000	2	0.006
CcDEE	1	0.019	2	0.026	0	0.0000	0	0.000	0	0.000	3	0.009
CcDEe	6	0.116	2	2.026	1	0.0185	11	0.122	1	0.015	21	0.062
CcDee	17	0.327	17	0.221	24	0.4440	31	0.344	24	0.364	113	0.333
Ccddee	0	0.000	1	0.013	1	0.0185	0	0.000	1	0.015	3	0.009
ccDEE	0	0.000	2	0.026	1	0.0185	1	0.011	4	0.061	8	0.024
ccDEe	1	0.019	1	0.013	2	0.3700	7	0.078	1	0.015	12	0.035
ccDee	1	0.019	3	0.039	6	0.1110	7	0.078	3	0.045	20	0.059
ccddEe	0	0.000	0	0.000	0	0.0000	1	0.011	0	0.000	1	0.003
ccddeE	9	0.173	4	0.052	1	0.0185	7	0.078	6	0.091	27	0.079
ccddEE	0	0.000	0	0.000	1	0.0185	0	0.000	0	0.000	1	0.003
Total	52	1.000	77	1.000	54	11.000	90	1.000	66	1.000	339	1.000
<i>P System</i>												
P _{1a}	14	0.359	46	0.590	19	0.358	37	0.420	17	0.405	133	0.443
P _{1c}	25	0.641	32	0.410	34	0.642	51	0.580	25	0.595	167	0.557
Total	39	1.000	78	1.000	53	1.000	88	1.000	42	1.000	300	1.000
<i>Kell System</i>												
Kk	2	0.048	1	0.022					2	0.027	5	0.031
kk	40	0.952	45	0.978					73	0.973	158	0.969
Total	42	1.000	46	1.000					75	1.000	161	1.000
<i>Duffy System</i>												
Fy ^{a+b-}	12	0.462							22	0.564	34	0.523
Fy ^{a+b+}	9	0.346							13	0.333	22	0.339
Fy ^{a-b+}	5	0.192							3	0.077	8	0.123
Fy ^{a-b-}	0	0.000							1	0.026	1	0.015
Total	26	1.000							39	1.000	65	1.000
<i>Lewis System</i>												
Le ^{a+b-}	9	0.250	3	0.097	10	0.208	12	0.293	1	0.200	35	0.217
Le ^{a+b+}	5	0.139	0	0.000	1	0.021	1	0.024	0	0.000	7	0.044
Le ^{a-b+}	20	0.556	19	0.613	34	0.709	28	0.683	4	0.800	105	0.652
Le ^{a-b-}	2	0.055	9	0.290	3	0.062	0	0.000	0	0.000	14	0.087
Total	36	1.000	31	1.000	48	1.000	41	1.000	5	1.000	161	1.000

jars to 0.3557 in Jats. The haplotype *cDE* was detected with frequency varying between 0.0232 and 0.0971 and *cDe* between 0.0192 and 0.2710.

The rare haplotype *Cde* was absent in Jats and Ahirs and occurred in Rajputs and Gujjars with frequencies of 0.0867 and 0.1126, respectively. Another rare haplotype *CDE* was detected only in Jats, Rajputs and "Others" with frequencies of 0.0191, 0.0139 and 0.0080, respec-

tively. Rather infrequent haplotype *cdE* was present only in Gujjars and Ahirs with a frequency of 0.0416 and 0.0195, respectively. The frequencies of Rh haplotypes observed in the present study were generally compatible with those reported earlier from the north Indian populations (Bhasin et al., 1992, 1994).

The P System

The incidence of P₁ positives in Haryana

Table 2 : Haplotype/allele frequencies of Rhesus, P, Kell and Duffy blood groups in Haryana

Haplotype/allele	Jats	Rajputs	Gujjars	Ahirs	Others	Total
CDE	.0191±.0189	.0139±.0097	.0000±.0000	.0000±.0000	.0080±.0079	.0075±.0037
CDe	.5386±.0507	.6267±.0522	.4429±.0677	.5111±.0373	.5571±.0478	.5451±.0221
CdE	.0000±.0000	.0000±.0000	.0000±.0000	.0000±.0000	.0000±.0000	.0000±.0000
Cde	.0000±.0000	.0867±.0414	.1126±.0568	.0000±.0000	.0258±.0245	.0374±.0131
cDE	.0674±.0279	.0576±.0189	.0232±.0198	.0971±.0269	.0753±.0230	.0637±.0115
cDe	.0192±.0189	.0557±.0288	.2710±.0645	.1088±.00366	.0609±.0328	.0839±.0169
cdE	.0000±.0000	.0000±.0000	.0416±.0235	.0195±.0185	.0000±.0000	.0158±.0081
cde	.3557±.0504	.1595±.0369	.1087±.0568	.2635±.0434	.2729±.0463	.2466±.0212
χ^2 (HW)	8.6388	25.7595	10.4258	.7063	21.7243	38.9126
d.f.	10	10	10	10	10	10
Prob.	0.70>P>0.50	P<0.01	0.50>P>0.30	P>0.99	0.02>P>0.01	P<0.01
P	.199±.048	.359±.043	.199±.041	.239±.035	.228±.049	.254±.019
P ₂ +P	.801±.048	.641±.043	.801±.041	.761±.035	.771±.049	.746±.019
K	.024±.017	.011±.011			.013±.009	.015±.007
k	.976±.017	.989±.011			.987±.009	.985±.007
χ^2 (HW)	.048	.0110			.0270	.077
d.f.	1	1			1	1
Prob.	0.9>P>0.3	0.95>P>0.90			0.90>P>0.80	0.80>P>0.70
Fy ^a	.583±.087				.654±.068	.622±.053
Fy ^b	.334±.073				.223±.049	.264±.041
Fy	.083±.086				.123±.060	.114±.048
χ^2 (HW)	.6190				.8110	.0740
d.f.	1				1	1
Prob.	0.50>P>0.30				0.50>P>0.30	0.80>P>0.70

showed a wide range from as low as 35.8% in Gujjars to as high as 59% in Rajputs. The P₁ allele varied from 0.199 in Gujjars and Jats to 0.359 in Rajputs. Among the neighbouring populations of Punjab, Rajasthan, Delhi and Uttar Pradesh the incidence of this allele ranges between 0.297 and 0.586 (Das et al., 1978; Papiha et al., 1982), although from Himachal Pradesh a frequency as low as 0.100 has been reported (Chahal, 1981).

The Kell System

In the three groups investigated for these blood groups, the overall incidence of the heterozygote phenotype Kk was recorded 3.1% the rare phenotype being encountered in each of them. The frequency of the K allele in the

present Haryana material (0.015) is well within the range (0.004-0.074) reported for the neighbouring populations (Papiha et al., 1972, 1980).

The Duffy System

In the two groups studied here for this system viz. Jats and "Others", four phenotypes, including a single case of Fy^{a+b} in the latter group were observed. This is the first report of Duffy null phenotype in entire north Indian region. The Fy^a allele frequency was recorded 0.622 while the silent allele Fy occurred with a frequency of 0.114. This compares well with the general range of Fy^a (0.467-0.588) so far reported in the neighbouring populations of Punjab (Papiha et al., 1972; Chahal, 1981)

The Lewis System

Four phenotypes viz. Le^{a+b} , Le^{a+b+} , Le^{a+b-} and Le^{a+b} were detected with varying frequencies in the four population groups tested barring the Ahirs in which no null phenotype (Le^{a+b}) was found. The most frequent phenotype Le^{a+b} varied from 55.6 to 70.9% in these groups. Comparative information is lacking from the neighbouring populations since such have been tested only with anti- Le^a . However, in them the incidence of the Le^a antigen has been reported in the range of 6.9-32.7% (Paphia et al., 1982). On pooling the phenotypes Le^{a+b} and Le^{a+b+} , the frequency of the Le^a antigen obtained in present Haryana sample ranges between 9.7% and 38.9%, with an average of 26.1%. The incidence of the null phenotype in Haryana varied from 2.9 to 6.2% which is similar to the range of this phenotype (0.9%) reported from West Bengal (Roy and Das, 1973; Das et al., 1974).

As regards Le^{a+b+} phenotype, Das et al. (1974) reported its presence (0.93%) in a sample from West Bengal. In the present study this unexpected phenotype has been found with a rather high frequency of 4.4%, an observation which could be attributed to the common technical error in mistakingly identifying some of the Le^{a+b} and Le^{a+b+} phenotypes as Le^{a+b+} , since the results could not be confirmed on repeat samples. However, the excess of this phenotype especially only in one group *i.e.* Jats warrants further investigation to support or refute the present findings and clarify the position.

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