

Distribution of Red Cell Enzyme Systems Among Gujjars and Three Dogra Population Groups of Jammu District, Jammu and Kashmir, India

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ABSTRACT In the present paper, baseline data on phenotype and gene frequency distributions of seven red cell enzyme systems (AP, ADA, AK, EsD, GPI, GLO I, PGM₁) in Gujjars-a Scheduled Tribe and three Dogra caste groups - Brahmans, Rajputs and Ramdasias (Scheduled Caste), of Jammu district of Jammu and Kashmir are presented.

In view of the vastness of India and its people, investigations into genetic composition of numerous endogamous caste, tribal, linguistic and religious groups in the country are still relatively few.

The data available on the genetic markers for Jammu and Kashmir are very limited; except a few serological investigations, only a single report on the distribution of red-cell enzyme polymorphisms, among Sunni Muslims of Kashmir valley, is available (Chahal et al., 1989 a). But, there are no data available on the red cell enzyme variation among the population groups of Jammu division. This, therefore, is the first comprehensive report on the distributions of various red cell enzymes from the Jammu division of Jammu and Kashmir, presenting data on seven different systems [acid phosphatase (AP), adenosine deaminase (ADA), adenylate kinase (AK), esterase D (EsD), glucose phosphate isomerase (GPI), glyoxalase I (GLO I), phosphoglucomutase locus 1 (PGM₁)] among the Gujjars - a transhumant scheduled tribe and three Dogra caste groups-Brahmans, Rajputs and Ramdasias (scheduled caste) of Jammu district of Jammu and Kashmir.

MATERIAL AND METHODS

In 1988 and 1989 a total of 367 blood samples were collected from Jammu district, Jammu and Kashmir, from Gujjars (n=86) and various Dogra caste groups-Brahmans (n=105), Rajputs (n=71) and Ramdasias (n=105). The horizontal electrophoresis was carried out for the typing of red cell enzymes from haemolysates using techniques described by Harris and Hopkinson (1976) for AP and GPI; Scott and Fowler (1982) for GLO I; Murch et al. (1986) for ADA and AK; and Wraxall and Stolorow (1986) for PGM₁ and EsD. The gene frequency calculations have been done after Mourant et al. (1976).

RESULTS AND DISCUSSION

Tables 1 and 2 give the details of the distribution of phenotypes and gene frequencies respectively for seven red cell enzyme systems among the Gujjars and three Dogra caste groups - Brahmans, Rajputs and Ramdasias.

Acid phosphatase (AP) system

Among the population groups of the present study, all the three common genes P^a , P^b and

P^c have been observed. The P^c frequency ranges from 28.17 (Dogra Rajputs) to 37.79 per cent (Gujjars). The P^c gene has been detected in polymorphic proportions in Gujjars (2.33 per cent), Dogra Brahmans (1.43 per cent) and Dogra Rajputs (2.11 per cent). The present populations are showing similar distribution of AP system as observed among various population groups of north India [Brahmins of Himachal Pradesh (Chahal et al., 1991), Jat Sikh of Punjab (Chahal and Papiha, 1981) Jat of Haryana (Papiha et al., 1976), Rajputs of Delhi (Blake et al., 1971)]

Adenosine deaminase (ADA) system

The frequency of gene ADA^2 was observed low among the Gujjars (11.63 per cent) as compared to that observed among various Dogra caste groups, where it ranges from 14.08 (Dogra Rajputs) to 16.19 (Dogra Ramdasias) per cent. Gujjars of present study are showing almost similar frequency as observed among the Gujjars of Haryana (Kushwaha et al., 1990); Muslims of Delhi (Papiha et al., 1976); Rajputs of Rajasthan (Papiha et al., 1982). The Dogra caste groups of present study are showing similarities with Sunni Muslims of Jammu and Kashmir (Chahal et al., 1989 a); Rajput (Chahal, 1981), Chamar (Papiha et al., 1982), Kanet of Nachar (Papiha et al., 1984) of Himachal Pradesh; Punjabis (Papiha et al., 1972), Jat (Singh et al., 1974), Ramdasias Sikh (Papiha et al., 1982) of Punjab; Jat of Haryana (Kushwaha et al., 1990; Papiha et al., 1976) and Rajputs of Rajasthan (Papiha et al., 1982).

Adenylate kinase (AK) system

The frequency of AK^2 was observed over 10 per cent in all the groups barring Dogra Rajputs (4.23 per cent). Gujjars of present study show high frequency of gene AK^2 (13.95 per

cent) which falls near to that observed among Brahmin (Chahal et al., 1991); Koli (Papiha et al., 1984) of Himachal Pradesh; Ramgarhia Sikh (Chahal et al., 1986) of Punjab; Jat of Haryana (Kushwaha et al., 1990).

Dogra Brahmans and Dogra Ramdasias exhibit similarities with other caste groups and communities like Gaddi-Rajputs (Chahal, 1981; Papiha et al., 1982); Panjabi (Papiha et al., 1972); Jat (Singh et al., 1974); Ramdasias Sikh (Chahal et al., 1986).

Esterase D (EsD) system

Among the population groups of present study, The EsD^2 gene frequency ranges from 16.67 per cent (Dogra Brahmans) to 25.35 per cent (Dogra Rajputs). A rare gene EsD^3 has also been detected among Gujjars with a frequency of 0.6 per cent. Gujjars show similar distribution as observed among Gaddi - Rajputs (Chahal et al., 1982; Papiha et al., 1982); Chamar (Papiha et al., 1982); Punjabis (Cartwright et al., 1976; Papiha and Nahar, 1977); Rajput of Haryana (Kushwaha et al., 1990). Among the Jat Sikh (Woolley et al., 1983; Chahal et al., 1986); Jat (Papiha and Nahar, 1977; Kushwaha et al., 1990); and Paliwal Brahmin (Papiha et al., 1982), also similar frequency has been observed as among the Dogra Brahmans of present study. Whereas, Dogra Ramdasias are showing a little high frequency of EsD^2 depicting their closeness with Rajput (Chahal, 1981), Mahajan (Chahal et al., 1991); Himachalis (Papiha and Nahar, 1977); Ramgarhia Sikh (Chahal et al., 1986) and Kamboh (Chahal et al., 1989b). Among Dogra Rajputs, the gene EsD^2 is most frequent (25.3 per cent) which is quite similar to that observed among Gaddi - Brahmin (Chahal et al., 1982); Ramgarhia Sikh of Punjab (Chahal et al., 1986) and Rajput of Delhi (Ghosh, 1977).

Table 1: Distribution of red cell enzyme among Gujjars and Dogras of Jammu and Kashmir

Enzyme/ Phenotype	Number Observed			
	Gujjars	Dogra Brah- mans	Dogra Rajputs	Dogra Ram- dasias
AP				
A	12	13	7	11
BA	39	43	24	47
B	31	46	37	46
CA	2	1	2	1
CB	2	2	1	0
Total	86	105	71	105
ADA				
1-1	67	78	52	75
2-1	18	24	18	26
2-2	1	3	1	4
Total	86	105	71	105
AK				
1-1	63	83	65	84
2-1	22	22	6	19
2-2	1	0	0	2
Total	86	105	71	105
EsD				
1-1	54	72	40	60
2-1	26	31	26	40
2-2	5	2	5	5
Total	86*	105	71	105
GPI				
1-1	86	105	70	105
3-1	0	0	1	0
Total	86	105	71	105
GLO I				
1-1	5	2	5	3
2-1	41	34	26	40
2-2	40	69	40	62
Total	86	105	71	105
PGM₁				
1-1	34	45	31	51
2-1	40	49	34	46
2-2	12	11	5	7
7-1	0	0	1	1
Total	86	105	71	105

*Include one EsD 3-1 phenotype

Table 2: Gene frequencies of red cell enzymes among Gujjars and Dogras of Jammu and Kashmir

Enzyme/Gene	Gene Frequency			
	Gujjars	Dogra Brah- mans	Dogra Rajputs	Dogra Ram- dasias
AP				
<i>P^a</i>	37.79	33.33	28.17	33.33
<i>P^b</i>	59.88	65.24	69.72	66.19
<i>P^c</i>	2.33	1.43	2.11	0.48
Total	100.00	100.00	100.00	100.00
ADA				
<i>ADA¹</i>	88.37	85.71	85.92	83.81
<i>ADA²</i>	11.63	14.29	14.08	16.19
Total	100.00	100.00	100.00	100.00
AK				
<i>AK¹</i>	86.05	89.52	95.77	89.05
<i>AK²</i>	13.95	10.48	4.23	10.95
Total	100.00	100.00	100.00	100.00
EsD				
<i>EsD¹</i>	78.49	83.33	74.65	76.19
<i>EsD²</i>	20.93	16.67	25.35	23.81
Total	100.00*	100.00	100.00	100.00
GPI				
<i>GPI¹</i>	100.00	100.00	99.30	100.00
<i>GPI³</i>	0.00	0.00	0.70	0.00
Total	100.00	100.00	100.00	100.00
GLO I				
<i>GLO¹</i>	29.65	18.09	25.35	21.90
<i>GLO²</i>	70.35	81.91	74.65	78.10
Total	100.00	100.00	100.00	100.00
PGM₁				
<i>PGM₁¹</i>	62.79	66.19	67.60	70.95
<i>PGM₁²</i>	37.21	33.81	30.98	28.57
<i>PGM₁⁷</i>	0.00	0.00	1.41	0.48
Total	100.00	100.00	99.99	100.00

*Include *EsD³* frequency 0.58

Glucose phosphate isomerase (GPI) system

Among the Gujjars only common gene GPI^1 is present and no rare gene has been detected, an observation also made among the Gujjars from Haryana (Kushwaha et al., 1990). Among different Dogra caste groups, the rare gene GPI^2 was encountered only among Rajputs, though frequency is low (0.70 per cent). In this respect Dogra Rajputs are showing similarities with Punjabi (Papiha et al., 1972); Ramdasias Sikh and Jat Sikh (Chahal et al., 1987) and Rajput of Haryana (Kushwaha et al., 1990).

Glyoxalase I (GLO I) system

The Gujjars are showing GLO^1 frequency of 29.65 per cent, which is lower than that reported among the Gujjars from Haryana (Kushwaha et al., 1990) but similar to that observed among Sunni Muslims (Chahal et al., 1989a); Jat Sikh (Chahal and Papiha, 1981); Rajput (Kushwaha et al., 1990) and Muslims (Ghosh, 1977).

Among the Dogra caste groups the frequency of GLO^1 ranges between 18.09 and 25.35 per cent, which is similar to that reported for various caste groups of north India. Dogra Rajputs (25.35 per cent) are falling closer to Gaddi - Rajputs of Himachal Pradesh (Chahal et al., 1982), while the other two Dogra caste groups - Dogra Brahmans (18.09 per cent) and Dogra Ramdasias ((21.90 per cent) are exhibiting similarities with the Mahajans of Chamba district (Chahal et al., 1991); Kamboh (Chahal et al., 1989b) and Jat Sikh (Chahal et al., 1986) of Punjab.

Phosphoglucosmutase locus 1 (PGM₁) system

Gujjars show their closeness in the distribution of PGM_1^2 gene frequency (37.21 per cent) with various population groups of Haryana [Rajput (Kushwaha et al., 1990); and Jat (Papiha et al., 1976)], Delhi [Arora and Khatri (Mukherjee et al., 1975)] and Rajasthan [Meena tribe (Papiha et al., 1982)].

Among the Dogra caste groups of present study, the PGM_1^2 frequency ranges from 28.57 to 33.81 per cent and similar frequencies have been reported among various caste groups like Gaddi Brahmans (Singh et al., 1982; Chahal et al., 1982); Brahmin, Khatri and Mahajan (Chahal et al., 1991); Gaddi - Rajput, Brahmin and Chowdhury (Papiha et al., 1982); Punjabi (Papiha et al., 1972); Arora of Punjab (Singh et al., 1974); Ahir (Kushwaha et al., 1990) and Paliwal Brahmin, Rajput, Oswal Mahajan (Papiha et al., 1982).

The rare gene PGM_1^7 encountered in the present study among Dogra Rajputs (1.41 per cent) and Dogra Ramdasias (0.48 per cent), has also been detected among several populations of North India (Blake et al., 1971; Papiha et al., 1972, 1976; 1982, Chahal, 1981; Chahal and Papiha, 1981; Chahal et al., 1991).

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