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Sickle Cell Haemoglobin and Glucose-6- Phosphate Dehydrogenase Deficiency among the Rajputs of Dadra and Nagar Haveli

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ABSTRACT Sickle cell haemoglobin and G-6-PD have been used as important markers in Anthropology. The present study deals with the screening of these markers among the Rajput population of Dadra and Nagar Haveli. The study aims to enhance the knowledge in the realm of population genetics vis-a-vis these two loci. Out of the 101 samples tested for sickle cell haemoglobin, 2.98% are found to have HBAS and allele frequency for *HB*S* is 0.030. Out of the 47 males screened for G-6-PD deficiency, 2.127% are found to be deficient and the allele frequency for *GD*def* is 0.021.

INTRODUCTION

Sickle cell anaemia (sickle cell disease) is a disorder of the blood caused by inherited abnormal haemoglobin. It is an autosomal recessive trait leading to hemolytic disease, when the gene is in homozygous (SS) form. In regard to anaemia the *HB*A* allele is dominant. In regard to blood cell shape there is incomplete dominance. While in regard to haemoglobin there is co-dominance. Sickle cell anaemia illustrates somewhat arbitrary nature of the terms incomplete dominance and co-dominance. The type of dominance depends on the phenotypic level at which the observations are being made – organismal, cellular or molecular (Suzuki et al. 1986).

G-6-PD deficiency is a hereditary, X-linked recessive enzyme defect as a result of which the body does not have enough of the enzyme glucose-6-phosphate dehydrogenase needed for the normal functioning of red blood cells. This deficiency can cause hemolytic anaemia, usually after exposure to certain anti-malarial drugs, foods, or even infections.

These two markers are important for anthropological studies and many populations have been screened for these markers because of their clinical importance. But since no such study has been carried out on the Rajput of Dadra and Nagar Haveli thus the present study aims at observing the relative frequency of these two markers in this population and to compare them with the other neighbouring caste populations.

MATERIAL AND METHODS

The present study which was conducted in the month of January, 2007, deals with the screening of the Rajputs of Naroli village *panchayat*, Dadra and Nagar Haveli. This Union Territory is surrounded on the west, north and east by Valsad district of Gujarat and in the south and south-east by Thane and Nasik districts of Maharashtra. It is situated between the parallels of 20^{o} and $20^{0}25'$ of latitude north and between the meridian $72^{0}50'$ and $73^{0}15'$ of longitude. It occupies an area of 491 square km. The population of Dadra and Nagar Haveli is 220490 (2001 census). More than 62 percent of the total population is tribal. In addition to Rajputs, other communities inhabiting this area are Ahirs, Chamars and Mahars, etc. The Rajputs of Dadra and Nagar Haveli (from Sanskrit *raja-putra*: "son of a king"), are one of the important castes of the Hindu society. Rajputs are surname (*aatak*) endogamous and *gotra* exogamous.

Blood samples by finger prick in EDTA-coated Eppendorf tubes were collected from 101 Rajputs (54 females and 47 males) unrelated individuals. Simple slide test or sodium metabisulphite test (Daland and Castle 1948) was done for Sickle cell trait to screen the individuals' blood sample as a preliminary test and later the zygosity was confirmed in the laboratory by carrying out agar gel electrophoresis. Screening for G-6-PD deficiency was performed by employing fluorescent spot test (Beutler and Mitchell 1968). Hardy-Weinberg equilibrium was tested using a χ^2 goodness of fit test.

RESULTS AND DISCUSSION

Of the 101 samples tested, 2.98% were found to be sicklers in the Rajput population (Table 1). No individual was found to be homozygous for HBS. *HB*S* allele frequency was found to be 0.03. The population was also in Hardy-Weinberg equilibrium as far as HBS locus was concerned (χ^2=1.518, 0.30<p<0.20, df.=1). When comparison was made with the other neighbouring caste populations, it showed non-significant differences: Chamar (χ^2 =0.183) of Surendranagar district (Negi 1976); Ahir (χ^2=1.340) of Jamnagar district, Gujarat (Negi 1976); Chamar (χ^2=0.153) of Poona district (Negi 1976), and Mahar (χ^2=1.090) of Ahmadnagar district of Maharashtra (Negi 1976). The average frequency of sickle cell trait in western India is 5.5% (Bhasin and Chahal 1996) ranging from 0.00 among the Chamar of Junagarh district of Gujarat (Negi 1976) to 31.40% among Gamit of Gujarat (Vyas et al. 1962). The frequency of sickle cell trait (2.98%) in the present study falls within the above reported range of frequencies.

As far as G-6-PD deficiency is concerned, 2.127% of the male population is found to be G-6-PD deficient (Table 2), with frequency being 0.021**.** Comparison with some neighbouring caste populations showed non-significant differences: Sindhi-Lohana Kshatriyas (χ^2=1.59) of Gujarat (Shanbhag and Bhatia 1974), Halai-Lohana Kshatriyas (χ^2=0.690) of Gujarat (Shanbhag and Bhatia 1974); Mahar (χ^2=1.260) of Bombay (Parikh et al. 1969), Nandiwala (χ^2=0.346) of Poona district of Maharashtra (Mutalik et al. 1974). The average frequency of G-6-PD deficients in west India is 4.4% (Bhasin and Chahal 1996), and it varies from 0.00 among the Saraswat Brahmans of Mangalore (Shanbhag and Bhatia 1974) to 19.62% among the Warlis of Gujarat (Joshi et al. 1978). The *GD*def.* frequency in the present study also falls within the range for western India as a whole.

Table 1: **Distribution of Sickle cell haemoglobin among the Rajputs of Dadra and Nagar Haveli**

Parameters		*Observed No.*	*Percentile*	*Allele frequency*	
Sickler	AS	3	0.0298	*HB*A*	0.970
	SS	0	0.0000	*HB*S*	0.030
Normal	AA	98	0.9702		
Total		101	1.0000		1.000

Table 2: **Distribution of G-6-PD deficient among the Rajputs of Dadra and Nagar Haveli**

Number tested	*Normal*		*Deficient*		*Allele frequency GD*def.*
	No.	*percentile*	*No.*	*percentile*	
47	46	0.979	1	0.021	0.021

It can be concluded that the frequencies of sickle cell trait and G-6-PD deficient individuals among the Rajput population are well comparable to the other populations of the neighbouring regions as they show non-significant differences.

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