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Study of Glucose-6-Phosphate Dehydrogenase Deficiency and Sickle Cell Anemia Among the Tamil Brahmins of Delhi

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ABSTRACT The distribution of G-6-PD deficiency and sickle cell anemia was studied among the Tamil Brahmins of Delhi. Blood samples were collected from 147 individuals out of whom 68 were males and 79 females. The detection of G-6-PD deficiency was done by Methemoglobin reduction test. Slide test using 2 percent sodium metabisulphite was used for detection of sickle cell trait. Low frequency of 2.72 percent G-6-PD deficient individuals was observed. Sickle cell anemia was found to be absent among the Tamil Brahmins of Delhi.

INTRODUCTION

Anthropologists have always tried to trace the human evolution and migratory histories using various genetic markers like that of sickle cell hemoglobin, G-6-PD deficiency. Vast data on different Indian populations with respect to G-6-PD deficiency and HBS is presently available (Bhasin et al., 1992, 1994; Bhasin and Walter, 2001). In the present paper an attempt is made to find the incidence of these two parameters among the Tamil Brahmins of Delhi.

Glucose-6-phosphate dehydrogenase (G-6-PD) is one of the key enzymes of hexose mono phosphate shunt pathway. G-6-PD deficiency is an X- linked recessive trait. This deficiency was reported to be the first pharmacogenetic disease, i.e. anaemia occurs among the deficient individual only on exposure to some specific drugs or fava beans. Thus, it is a genetic disease, which has opened up doors to a new field "Pharmacogenomics" in the post genome era.

Sickle cell anemia is a severe hemolytic disease characterized by a tendency of the red cells to become grossly abnormal in shape (sickle shaped) under conditions of oxygen tension. The difference in the HBS and HBA lies in the 6^{th} amino acid position of β-chain where glutamic acid is replaced by valine. The hemoglobin AS condition is reported to have resistance to malaria.

MATERIAL AND METHODS

For any study, in which allele frequencies of certain genes among population are to be calculated, the basic necessity is of a population with common gene pool. It is for this reason that the Tamil Brahmins settled in Delhi were selected for the present study. The Brahmins from Aryavartha settled in Tamilnadu are called "Tamil Brahmins". The Tamil Brahmins is a high caste group and is divided into many divisions and subdivisions, depending on the `Guru' they follow. In the present study two major sub castes were observed among the Tamil Brahmins: Ayyars (120) and Ayyangars (27). Tamil Brahmins are an endogamous group among whom not only sub caste endogamy is practised but also the divisional (within sub castes) endogamy is maintained. This was also evident in the present group when their marriage pattern was studied.

A total of 147 blood samples were collected from unrelated individuals by house-to-house visit using finger prick method out of which 79 were females and 68 were males. G-6-PD deficiency was tested using the techniques of Methemoglobin Reduction test (Brewer et al., 1960; Bhasin and Chahal, 1996). Gene frequencies with respect to G-6-PD system were calculated as described by Mourant et al. (1976).Screening for HBS was done using the slide test with 2% sodium metabisulphite (Daland and Castle, 1948).

RESULTS AND DISCUSSION

Distribution of G-6-PD deficiency among the males and females of Tamil Brahmins is set out in table 1. It is observed from the table that 3 males were G-6-PD deficient whereas one female was deficient for this enzyme. The cumulative percentage of deficient individuals was 2.72. The frequency of *Gd*def* allele among the Tamil Brahmins is 0.023, when both males and females

Table 1: Distribution of G6PD deficiency among Tamil Brahmins of Delhi.

S.No	*Sex*	*No. Tested*	*Normal*		*Heterozygotes*		*Deficient*		*Combined Gene Frequency*
			No.	*Percentile*	*No.*	*Percentile*	*No*	*Percentile*	
1	Male	68	65	0.956	_	_	03	.044	*Gd*def =0.023*
2	Female	79	78	0.987	_	_	1	.013	

are combined (Bhasin & Chahal, 1996). In the present study if only males are considered the frequency of *Gd*def* would be its percentile frequency (0.044). This deficiency is mainly confined in Mediterranean areas, Africa and India. In India the *Gd*def* allele has reached balanced polymorphic state in certain populations, where it is reported to be as high as 5 percent (Bhasin et al. 1992). Within India there is a gradual decrease in its frequency as one moves southward. On the basis of ethnic background scheduled tribes are reported to have a higher frequency compared to caste groups. Relatively low frequency of *Gd*def* observed in the present study among the Tamil Brahmins is as expected because of its south Indian origin and caste status.

Hemoglobin S, a trait with a frequency varying from complete absence to 48.58 percent (Punka, Madhya pradesh reported by Negi, 1976) is present among various population groups of India with a general frequency of about 5 percent (Bhasin and Chahal, 1996). The frequency of *HB*S* allele is highest among the scheduled tribes, followed by scheduled castes in India. Caste groups in general are reported to have complete absence of this trait. The presently studied population is found to have complete absence of the *HB*S* allele which is as expected, because the population under consideration belongs to a caste group.

As the frequency of the G-6-PD deficiency and HBS among Tamil Brahmins is similar to the frequency observed in other south Indian caste groups, it is apparent that these people in spite of their migration from Tamilnadu to Delhi are maintaining their homogeneity with respect to their gene pools.

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