

G6PD Deficiency, Sickle Cell Trait, Haptoglobin and Transferrin Polymorphisms among Koyadoras and Nayakpods of Andhra Pradesh

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ABSTRACT The present study was carried out among two tribal populations residing in Khammam district of Andhra Pradesh, South India. A sample of 132 Koyadora and 40 Nayakpod individuals of all ages were collected for the purpose of screening for the glucose-6-phosphate dehydrogenase deficiency, haptoglobins, transferrins and sickle cell trait.

INTRODUCTION

Genetic markers such as blood groups, red cell enzymes, serum proteins and now, DNA polymorphisms have been, and are, being studied by anthropologists to understand human population variations.

The present study was done among two tribes of Khammam district of Andhra Pradesh. The district is predominantly inhabited by the tribal population groups, the most common being Koyadoras, Lambadas, Konda Reddis, Erakulas and Yanadis.

Earlier the Nayakpods practised slash and burn cultivation in the wooded hills and secluded valley of Adilabad district. However, they are mostly found in the villages of the plains where they work as tenant farmers or agricultural labourers. They are scattered over a large area and pockets of Nayakpods are also found in Karimnagar, Khammam and Warangal districts of Andhra Pradesh. In physical features they closely resemble the Veddoids. They are regarded as a tribe of low status but superior to the 'polluting castes'. Koyadoras who call themselves Koitur in their own dialect are one of the predominant tribal groups in the East Godawari, Khammam, Warangal and Karimnagar districts of Andhra Pradesh. Koyas are considered to be a section of the Gondi speaking people because of their physical and linguistic affiliation with the Gonds of Adilabad district. Their primary occupation is agriculture labour and forest hunting gathering. Koyas are predominantly present in Namavaram, Balrajpet, Kamapagudam and Pentlam, whereas Nayakpods are predominant in Rajapuram (Narsapuram) and Abbugudem.

MATERIALS AND METHODS

The blood samples were collected from the Koyadoras and Nayakpods residing in six villages, namely Rajapuram, Namawaram, Balrajpet, pentlam, Abbugudam and Kamapagudam.

A sample of 132 Koyadoras and 40 Nayakpods individuals of all ages were collected for the purpose of screening for the Glucose-6-phosphate dehydrogenase deficiency, Haptoglobin and transferrin types and sickle cell trait. G-6-PD deficiency was detected by using methaemoglobin reduction test (Brewer et al., 1962). Haemoglobin S was screened by sodium metabisulphite test (Daland and Castle., 1948) and confirmed by agar gel electrophoresis using sodium citrate buffer, pH 6.2 (Garrick et al., 1973). Haptoglobins were phenotyped by the horizontal polyacrylamide gel electrophoresis using borate buffer pH 8.6. Transferrins were typed by agarose electrophoresis using sodium barbital buffer, pH 8.6.

RESULTS AND DISCUSSION

Glucose-6-Phosphate Dehydrogenase Deficiency

Seventy one (71) males and 61 females in Koyadoras and 20 each males and females in Nayakpods were tested for this enzyme deficiency. Gender wise distribution of G-6-PD deficiency among the Koyadora and Nayakpods has been set out in Table 1. It is observed from this table that among the Koyadoras 8.54 percent of the males were G-6-PD deficient whereas only 3.28 percent of women were deficient for this enzyme. Among the Nayakpods *G6PD*def* gene

Table 1: Distribution of G-6-PD deficiency among the Koyadora and Nayakpods of Khammam District, Andhra Pradesh

Population	Sex	No. tested	Normal		Heterozygotes		Deficient		Allele frequencies G6pd*def
			No.	%	No.	%	No.	%	
Koyadoras	Male	71	65	91.55	-	-	6	8.45	0.0845
	Female	61	59	96.72	2	3.28	0	0.00	0.0328
Nayakpods	Male	20	18	90.00	-	-	2	10.00	0.100
	Female	20	20	100.00	0	0.00	0	0.00	0.00

is absent in females whereas in males the gene frequency is 0.1. Koyadoras from various districts have been sampled earlier also and all showed some deficient individuals (Meera Khan, 1964; Goud, 1977; Rao and Goud, 1979). Nayakpods have been reported to be having a G-6-PD deficiency percentage close to 1% (Goud, 1977; Rao and Goud, 1979). The frequencies of G6PD deficiency in Andhra Pradesh varies from 0.00 among Mala, Pradhan, Pudura Dravida of Vishakapatnam and non-tribals of Pollavaram to as high as 9.5 among Hindus of Hyderabad. (Bhasin et al., 1992). Frequencies of G6PD deficiency were also reported by Roberts et al., 1980 among Hindus, Muslims and Lambadi of Andhra Pradesh as 0.057, 0.012, and 0.035 respectively.

Haemoglobins

In Koyadoras, the frequency of HB AA is 0.93 whereas the frequency of HB AS is 0.045. Along with these two types an unconfirmed variant HB A (F), where the mobility of the band is faster than A, has been observed in three individuals. In Nayakpods only the HB A phenotype has been observed (Table 2).

Table 2: Distribution of haemoglobin types among the Koyadoras and Nayakpods of Khammam District

Population	Number tested	Haemoglobin Types		
		A/A	A/S	A/A (F)
Koyadoras	132	123 (0.9318)	6 (0.045)	3 0.0227
Nayakpods	40	40(1.00)	-	-

The frequency distribution of *HB*S* allele among various Indian population groups has been reviewed and summarized by Bhasin et al., (1992) and Bhasin and Walter (2001). In the previous studies available on Nayakpods, except for the Nayakpods of Nizamabad district, where the sickler gene is reported absent (Muralidhar et al., 1989), sickling has been reported ranging from 4.5% to 5.4% (Goud, 1977; Goud and Rao, 1979a; Muralidhar et al., 1989). Koyadora tribals studied earlier from various regions of Andhra Pradesh show a sickler percentage ranging from 7.9 to 24.2% (Negi, 1976; Goud, 1977; Goud and Rao, 1979; Babu et al., 1980). The present study from Khammam District shows a lower frequency of this trait. (4.45).

Haptoglobins

The percentile phenotypic frequency of Hp 2 (0.5454) is preponderant one in Koyadora tribe and is followed by the heterozygotes HP 2-1 (0.3106) and HP 1 (0.1136). Rare phenotypes, Hp 2-1 and Hp 0, are present in Koyadora with a moderate frequency of 0.0152 each (Table 3). As usual the allele *HP*2* exhibits the highest frequency of 0.719.

Among the Nayakpods also the percentile frequency of HP 2-2 type is the maximum (0.675) followed by HP 2-1 (0.175) and HP 1-1 (0.150), though the *HP*2* allele has a slightly higher frequency (0.750) among Nayakpods as compared to that of Koyadoras (0.719).

In India, the frequency of *HP*1* allele is 0.160 (varies from complete absence among scheduled

Table 3: Distribution of haptoglobin phenotypes among the Koyadora and Nayakpods of Khammam District, Andhra Pradesh

Population	No. tested	Haptoglobin phenotypes										Allele frequencies	
		1-1		2-2		2-1		2-1M		0-0			
		No.	%	No.	%	No.	%	No.	%	No.	%	HP*1	HP*2
Koyadoras	132	15	11.36	72	54.54	41	31.06	2	1.52	2	1.52	0.281	0.719
Nayakpods	40	7	17.50	27	67.50	6	15.00	-	-	-	-	0.250	0.750

tribes of West Bengal to 0.406 among Dawoodi Bohras from Rajasthan; (Bhasin and Walter, 2001). Both Nayakpods and Koyadoras of other areas of Andhra Pradesh have been the subject of study earlier for haptoglobin type distribution, among Koyadoras, the frequency of Hp 1 allele ranges from 0.056 to 0.209 whereas for Nayakpods, it ranges from 0.125 to 0.250 (Bhasin et al., 1992). The frequency of the *HP*1* allele in the present sample of these population groups, collected from Khammam district, is higher than those reported earlier. The inter group χ^2 test between Koyadoras and Nayakpods did not reveal significant differences ($\chi^2 = 5.08$, df 2; $0.10 > p > 0.05$).

Transferrins

Out of 132 Koyadora individuals tested, along with TF C type, TF C, D type is also present with a percentile frequency of 0.02. In Nayakpods only the common TF C type is observed. Goud and Rao (1980) also studied the Koyadoras of Warangal and Khammam districts and reported the frequency of *TF*D* ranging from 1.3 to 4.5 %. Nayakpods also show a frequency of *TF*D* allele ranging from complete absence (Muralidhar et al., 1989) to 3.3% (Goud and Rao, 1980; Muralidhar et al., 1989).

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