Prevalence of Common Haemoglobinopathies among Scheduled Caste and Scheduled Tribes of Shahdol and Khandwa (East Nimar) Districts of Madhya Pradesh

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Abstract

The study aims to find the prevalence of common haemoglobinopathies and G6PD deficiency among main scheduled tribes and scheduled caste groups of Shahdol and Khandwa districts of Madhya Pradesh. A total of 405 and 577 blood samples from Shahdol and Khandwa districts were screened respectively for sickle haemoglobin, β-thalassaemia and G6PD deficiency. The prevalence of sickle cell trait was high in tribal population of Shahdol i.e. Panika (28.6%) and it was 5.1% among scheduled caste group. In Khandwa district, it was 16.9% in Korku and 14.1% among Balai. Only 10 persons were found with sickle cell disease (homozygous) in apparent healthy condition from both districts. Most of them had mild to moderate level of anaemia (Hb 7.5 to 11.7g/dl) with foetal haemoglobin levels ranging from 5.6% to 12.6%.Frequency of sickle cell gene was higher among tribals i.e. Panika and Korku than scheduled castes of both districts. The prevalence of β-thalassaemia trait ranged from 1.4% to 3.6% and G6PD deficiency varied from 0.7% in Balai (SC of Khandwa) to 2.8% in Panika tribe of Shahdol. Anaemia (as per WHO standard) was highest among Korku tribe (76.6%) of Khandwa. Iron deficiency was detected only among the populations of Khandwa district. It was 20.9% in Korku and 9.4% in Balai. Iron deficiency was higher among females as compared to males and children ($p<0.05$).

Introduction

Haemoglobinopathies which include sickle cell haemoglobin and thalassaemias are autosomal recessive inherited disorders of haemoglobin that results in anaemia. These disorders are important from clinical point of view as homozygosity causes life threatening crisis. G6PD is an enzyme of red blood cells which results in hemolysis during the administration of some anti-malarial or other oxidant drugs. Haemoglobinopathies are reported to be common in central India, especially in Madhya Pradesh (Bhatia and Rao, 1986; Gupta et al, 1991; Pande et al, 1992; Bhasin et al, 1994; Pande et al, 1999). The prevalence rate of β-thalassamia is not known for most of the tribes and scheduled castes of the state. Present study reports the prevalence of haemoglobinopathies and G6PD deficiency among the scheduled tribe and scheduled caste populations of Shahdol and Khandwa districts of Madhya Pradesh.

Panika is the main scheduled tribe of Shahdol district but in other districts of Madhya Pradesh, Panika is not listed as scheduled tribe. Choudhary is the major scheduled caste population of this district. Korku is the most backward tribe in Khandwa district and live in deep forest and hilly areas. Balai is also the scheduled caste of this district.

Material and Methods

A total of 405 blood samples (210 of Panika and 195 of Choudhary, scheduled caste) from Shahdol district and 577 blood samples (301 of Korku and 276 of Balai) from

Khandwa district were collected after obtaining their written consent. These samples were screened for sickle cell haemoglobin, β-thalassaemia and G6PD deficiency. Complete blood cell count (CBC) was done by automatic blood cell counter. Sickle haemoglobin was identified by sickling test with 2% sodium metabisulphite and electrophoresis was done on cellulose acetate membrane with TEB (Tris-EDTA-Borate) buffer at pH 8.6 and agar gel electrophoresis at pH 6.0(Chanarin1989). HbA_2 was quantified by column chromatography (Dacie and Lewis 1991) to diagnose the β- thalassaemia trait. G6PD deficiency was detected by using DCIP decolorization method. Statistical methods used were Chi-square test and Proportionate test (Z-test).

Results

The prevalence of haemoglobonopathies and G6PD deficiency among scheduled tribe and scheduled caste populations of Shahdol and Khandwa districts have been given in the Table-1. In Shahdol district the prevalence of sickle cell trait was higher in ST's i.e. 28.6% in Panika than SC group i.e. Choudhary (5.1%) with a gene frequency of 0.1762 for Panika and 0.0256 for Choudhary. The prevalence of sickle cell trait in Khandwa district was 16.9% among Korku, 14.1% in Balai with gene frequency of 0.0914 and 0.0743 among Korku and Balai respectively (Table 2). Populations of different groups of both districts were not in equilibrium state for sickle cell haemoglobin gene as per Hardy-Weinberg law ($p<0.05$).

Table 1: Percent prevalence of haemoglobinopathies among different populations of Shahdol and Khandwa districts of Madhya Pradesh

Dist.	Population	n	HbAS	HbSS	β-thal. trait	G6PD def.
Shahdol	Panika(ST)	210	28.6	3.3	1.4	2.8
	Choudhary(SC)	195	5.1	0	3.6	2.6
Khandwa	Korku(ST)	301	16.9	0.7	2.3	1.3
	Balai(SC)	276	14.1	0.4	2.5	0.7

Table 2: Gene frequencies and expected number of births among different populations of Shahdol and Khandwa districts of Madhya Pradesh

Dist.	Population	Gene freq. of 'HbS'	Expected Nos. (per 1000 births)	
			Hb AS	Hb SS
Shahdol	Panika(ST)	0.1762	290.3	31.0
	Choudhary(SC)	0.0256	50.0	0.7
Khandwa	Korku(ST)	0.0914	166.0	8.3
	Balai(SC)	0.0743	137.5	5.5

The prevalence of β-thalassaemia trait in Shahdol district was 3.6% among Choudhary and it was 1.4% among Panika. In Khandwa, it was 2.3% and 2.5% among Korku and Balai groups respectively. The prevalence of G6PD deficiency in the study area was 2.8% in Panika, 2.6% among Choudhary. In Khandwa, it was 1.3% in Korku and 0.7% in Balai.

Table 3 shows that seven persons (4 females and 3 males)belonging to Panika, varying between 5 to 28 years of age in Shahdol district and three males aged from 8 to 34 yrs of Khandwa district were homozygous for sickle cell gene in apparent healthy condition. All sickle cell homozygous persons had mild to moderate level of anaemia (Hb 7.5 to 12.2 g/dl) except one female who was severely anaemic (Hb – 6.3g/dl). HbF levels of these patients were ranging from 5.6% to 12.6%.The higher level of HbF could not be correlated to Hb levels and CBC indices in homozygous sickle cell persons.

Table 3: Haematological parameters in sickle cell disease patients of Shahdol and Khandwa districts of Madhya Pradesh

	Age/ Sex	Hb (g/dl)	PCV (L/L)	TRBC (X 10^6)	MCV (fl)	MCH (pg)	MCHC (g/dl)	HBF %	HBA2 %
Panika	28/M	11.1	0.29	3.5	85	32.1	37.9	5.6	1.0
Panika	16/M	8.3	0.22	2.91	75	28.7	38.1	5.9	1.74
Panika	25/F	7.5	0.18	2.49	74	30.1	40.8	6.66	1.9
Panika	28/F	6.3	0.16	2.5	65	25	38.7	6.64	2.75
Panika	8/M	10.9	0.29	3.68	69	29.6	37.4	6.7	0.87
Panika	5/F	9.4	0.24	2.8	67	23.3	33.7	9.68	1.53
Panika	5/F	10.6	0.27	3.9	80	27.2	39.1	8.26	1.1
Korku	15/M	12.2	0.34	4.7	71	25.6	35.9	12.6	2.9
Korku	8/M	9.3	0.22	2.1	104	44.9	43.0	11.8	2.6
Balai	34/M	8.8	0.21	2.3	93	38.8	41.7	11.2	1.6

Table 4: Percent anaemia among different populations of Shahdol and Khandwa districts of Madhya Pradesh

Population	Group	n	Type of anaemia			Total anaemia	Iron def.
			Mild	Moderate	Severe		
Panika (ST)	Male	75	37.3	0	1.3	38.6	Not done
	Female	103	38.8	12.6	0	51.4	Not done
	Children	26	50.0	0	0	50.0	Not done
	Total	204	39.7	6.4	0.5	46.6	Not done
Choudhary (SC)	Male	87	47.1	6.9	0	54.0	Not done
	Female	71	33.8	8.4	1.4	43.6	Not done
	Children	37	27.0	5.4	0	32.4	Not done
	Total	195	38.5	7.2	0.5	46.2	Not done
Korku(ST)	Male	136	59.5	1.5	1.5	62.5	7.3
	Female	119	66.4	18.5	3.4	88.2	39.3
	Children	44	77.3	11.4	0	88.6	8.1
	Total	299	64.9	9.7	2.0	76.6	20.9
Balai (SC)	Male	137	43.1	4.4	2.2	49.6	6.6
	Female	62	43.5	8.1	3.2	54.8	18.9
	Children	76	68.4	7.9	0	76.3	4.2
	Total	275	50.2	6.2	1.8	58.2	9.4

The prevalence of anaemia (as per WHO standard) of both the districts is given in Table 4. Overall anaemia was 46% in Choudhary and Panika of Shahdol. In Khandwa, the prevalence of anaemia was significantly higher ($p<0.05$) among tribal population (76.6%) than Scheduled caste population (58.2%). Most of the anaemic persons fall under mild category (Hb 10-12gm/dl). 12.6% and 18.5% females of Shahdol and Khandwa respectively were moderately anaemic. Severe anaemia was ranged from 0.5 to 2 percent in all the four populations of both the districts. In Khandwa district, Iron deficiency was observed to be more in females of both groups compared to males and children ($p<0.05$).

Discussion

Sickle haemoglobin is commonly prevalent among the tribal groups of Shahdol and Khandwa districts of Madhya Pradesh. As reported by Bhatia and Rao (1986), the presence of sickle haemoglobin in Oraon tribe of Chhattisgarh was absent though it was as high as 31% in Bhilala tribes of Central India. The prevalence of β-thalassaemia was low as compared to sickle cell haemoglobin in the studied populations. It is apparent that the population having high prevalence of sickle haemoglobin tends to have lower prevalence of β-thalassaemia.

The present findings suggest that 31 per thousand births among Scheduled tribe (Panika) and 0.7 per thousand in Scheduled caste of Shahdol district are expected to suffer from sickle cell disease (homozygous). About 290/1000 is expected to be born with sickle haemoglobin as a trait (heterozygous) in Panika tribe with the present rate of prevalence of sickle haemoglobin. Similarly 8/1000 of Korku and 6/1000 of Balai new born babies are expected to suffer from sickle cell disease (homozygous).

Anaemia was very high in Korku tribe especially in females. Overall, anaemia is more prevalent in females and children of both the districts. High prevalence of anaemia may be due to various reasons like nutritional deficiency, worm infestation and malaria etc. A large proportion of Korku (20.9%) and Balai (9.4%) were having Iron deficiency as indicated by elevated levels of erythrocyte zinc protoporphyrin levels.

The study concludes that there is an urgent need of suitable intervention policies for prevention and management of sickle cell disease in tribals. They need to be educated regarding sickle cell disease and thalassaemia through initiation of prevention programme at national level. The facilities for prenatal diagnosis and management of these disorders should be established at grass root level.

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