High Prevalence of Sickle Haemoglobin in Mehra Caste of District Betul, Madhya Pradesh

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Abstract

A total of 1070 individuals from Betul district, Madhya Pradesh, belonging to Gond and Korku scheduled tribes and Mehra and Basod scheduled castes were screened for haemoglobinopathies and G6PD deficiency. Sickle haemoglobin has a high prevalence in this area, particularly in Mehra scheduled caste (34.4 %). Beta thalassaemia is not common in the study area and its prevalence is found highest in Korku tribe (3.9%). Overall the prevalence of anaemia is 54 % in the study area but of mild type.

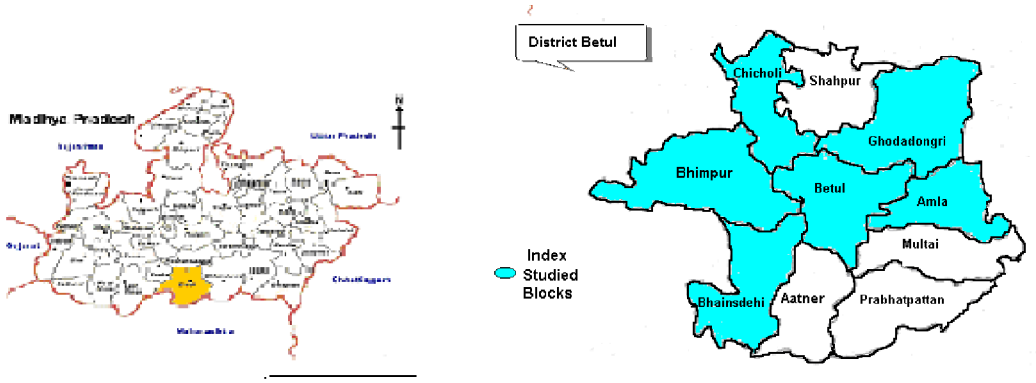
Introduction

Haemoglobinopathies are inherited abnormalities of globin part of haemoglobin and the defect lies either in the structure or in the synthesis of haemoglobin molecule. Sickle haemoglobin (HbS) is the most common structural variant of haemoglobin in India, although HbD and HbE are also found. In HbS, glutamic acid (an amino acid) at the 6^{th} position of beta chain is replaced by valine. Substitution of this single amino acid at a crucial site causes great changes in the property of haemoglobin leading to its less solubility at reduced oxygen tension. Heterozygousity of sickle haemoglobin is asymptomatic but the homozygousity of this disorder causes series of complications leading to reduced life expectancy. Similar observations were made by Platt et al. (1994). Occurrence of other common abnormal haemoglobins like HbD or HbE is relatively less prevalent in central India and is milder in clinical complications.

β-thalassaemia as a trait is almost asymptomatic; while in homozygous state, it leads to life threatening complications and the person is dependant on regular blood transfusions for survival. G6PD deficiency is an X-linked disorder and causes haemolytic episode when red blood corpuscles (RBC) are exposed to certain oxidant drugs such as some anti-malarial drugs.

Geographical distribution of the above genetic disorders almost overlaps the areas where malaria is or was once endemic. The findings of Haldane (1949) Allison (1954) and Allen (1997) indicate that these variants give protection against fatal malaria. Finding out the prevalence rates of these disorders in various ethnic groups from different geographic areas is very helpful in preparing the strategies for their management and prevention.

Fig. 1: Study area



District Betul is situated in the southern part of Madhya Pradesh and its border touches the neighboring state of Maharashtra. Total population of this district is 13,95,175 (Census 2001). Of this, 39.4% and 10.6% is constituted by scheduled tribes and scheduled castes respectively. Gond and Korku are main scheduled tribes and Mehra and Basod are main scheduled castes of the district. Main occupation of these groups is agriculture & labour and their socioeconomic conditions are generally poor. The distribution of ST and SC population in the district is not uniform, and the blocks which had higher proportion of Scheduled Tribe/ Scheduled Caste were selected for the study (Fig. 1).

Material and Methods

About 3 ml blood was collected in EDTA vials to screen for sickle haemoglobin, β-thalassaemia, G6PD deficiency and complete blood counts (CBC). Immediate blood relations were avoided while selecting individual. Family was taken as sampling unit. CBC was performed only on 1054 blood samples using an automatic blood cell counter. G6PD status was assessed by DCIP decolorisation technique. HbS was first identified by slide test using 2% sodium metabisulphite as the reducing agent. Presence of HbS was confirmed by electrophoresis on cellulose acetate at pH 8.5 and on agar gel at pH 6.0 (Chanarin, 1989). HbA_2 was quantitated by micro column chromatography using anion exchange resin DEAE-52 (Huisman, 1975). HbF was quantitated by alkali denaturation method (Betke, 1959).

Results

The prevalence of sickle haemoglobin, β-thalassaemia and G6PD deficiency is given in Table 1. Sickle haemoglobin is very common in all the studied groups, ranging from 12.1% to 34.4%. Highest prevalence of sickle haemoglobin was found in Mehra population i.e., 34.4% followed by Basod (20.3%), Korku (14.5%) and Gond (12.1%). Alongwith sickle haemoglobin, β-thalassaemia is also found in study area but with a lower prevalence rate ranging from 0% to 3.9%. β-thalassaemia is more common in STs as compared to SCs. G6PD deficiency is also common ranging from 2 to 3 % in various population groups. The gene frequency for sickle haemoglobin was 0.1818 in Mehra, 0.1057 in Basod, 0.076 in Korku and 0.0635 in Gond.

Table 1: Prevalence of haemoglobinopathies among various population groups

Population	n	HbAS %	HbSS %	G6PD def. %	βthal trait %	n*
Korku	296	13.8	0.7	2.7	3.9	258
Gond	299	11.4	0.7	3.0	1.0	292
Mehra	352	32.4	2.0	2.0	0.3	351
Basod	123	19.5	0.8	2.4	0.0	

*n given in last column indicates the tests done

Table 2: Prevalence of anaemia among various groups

		n	Mild %	Moderate %	Severe %	Total %
Korku	Male	104	45.2	2.9	0	48.1
	Female	74	51.3	25.7	1.3	78.3
	Children	116	54.3	8.6	0.8	63.7
	Total	294	50.3	10.9	0.7	61.9
Gond	Male	67	59.7	0	0	59.7
	Female	46	39.1	13.0	2.2	54.3
	Children	184	57.6	5.9	1.1	64.6
	Total	297	55.2	5.7	1.0	61.9
Mehra	Male	128	36.7	1.6	0	38.3
	Female	157	47.8	10.8	1.3	59.9
	Children	60	60.0	6.7	1.7	68.4
	Total	345	45.8	6.7	0.9	53.4
Basod	Male	49	20.4	2.0	0	22.4
	Female	44	36.4	6.8	2.3	45.5
	Children	25	52.0	8.0	8.0	68.0
	Total	118	33.1	5.1	2.5	40.7
	Grand total	1054	46.1	7.1	1.3	54.5

Anaemia (as per WHO classification) was widely prevalent in all the four population groups (Table 2). Anaemia was highest in Korku and Gond tribes (61.9 %), followed by Mehra (53.3 %), and Basod (40.7 %). Most of the anaemic population (80-90 %) was in mild category i.e. Hb < 12 g/dl. Overall prevalence of anaemia was more in females and children as compared to adult males. In Korku tribe, 78.3 % females were found to be anaemic. Among these females, 51.3 % had mild anaemia and 25.7 % had moderate anaemia. In the children group, anaemia was highest in Mehra caste (68.4 %), though most of the children (60 %) were mildly anaemic.

Table 3: Haematological parameters of sickle positive cases among SCs

	Caste	n	Hb g/dl	PCV %	TRBC 10^6/µl	MCV fl	MCH pg	MCHC g/dl	HbF %	HbA_2 %
AS	Mehra	114	12.24 ±1.69	33.8 ±4.7	4.68 ±0.7	73.34 ±8	26.56 ±3.75	36.16 ±2.44	1.46 ±1.2	-
	Basod	24	11.5 ±3.07	33.3 ±4.8	4.85 ±0.82	68.57 ±7.08	24.42 ±3.6	35.3 ±2.94	1.43 ±0.84	-
SS	Mehra	9	9.93 ±2.32	27.7 ±5.51	3.67 ±0.75	76.06 ±4.65	26.92 ±1.68	35.45 ±2.12	9.7 ±1.38	2.18 ±0.44
	Basod	1	8.9	24.2	2.91	83.2	30.6	36.8	12.48	2.93

Haemtological parameters of sickle cell trait and sickle cell homozygous in Mehra and Basod scheduled castes, is given in Table 3. The mean haemoglobin in sickle cell trait was 12.24± 1.69 g/dl for Mehra and 11.5± 3.07 g/dl for Basod. The mean haemoglobin in normal (HbAA) for the two SC groups were 12.38±1.64 g/dl for Mehra and 13.21±2.43 g/dl for Basod. There was no significant difference in mean haemoglobin level in sickle cell trait and normal (HbAA). In sickle cell disease (homozygous), the mean haemoglobin levels were 9.93± 2.32 g/dl for Mehra and 8.9 g/dl for Basod. Mean HbF concentration was 9.7 % in Mehra and 12.48 % in Basod.

Discussion

The common form of haemoglobinopathies in the study area is sickle haemoglobin followed by β-thalassaemia. Prevalence of sickle haemoglobin is very high in scheduled caste groups (Mehra 34.4 %, Basod 20.3%) as compared to scheduled tribe groups (Korku 14.5 %, Gond 12.1%). On the other hand, the scheduled tribes had higher prevalence of β-thalassaemia. The prevalence of G6PD deficiency is almost similar in all the four population groups. The findings suggest that about 33 per thousand of new born babies of Mehra group will be suffering from sickle cell disease. The proportion of sickle cell diseased babies in other population groups will be 11 for Basod, and 9 for Korku per thousand births. In Korku and Gond tribes, a small proportion of these babies will have both sickle haemoglobin and β-thalassaemia gene.

Anaemia is more common in scheduled tribes i.e., Korku and Gond than scheduled castes. Though most of the anaemic population of the study area fall under mild category i.e., Hb level more than 10.0 g/dl, but a sizable proportion of adult females and children (upto 12 years) of all the four population groups have moderate to severe grades of anaemia. It is probably due to either nutritional deficiency or commonly occurring morbidities.

The sickle haemoglobin was found to be highly prevalent in Mehra caste and also in Basod caste. Hence there is an urgent need to establish diagnostic and management programme in tribal areas for the management of haemoglobinopathies and anaemia. It is also desired to study the health and nutritional profile of these vulnerable groups to understand their hidden health related problems

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