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Anemia and hemoglobinopathies in tribal population of Eastern and North-eastern India

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Abstract

It is estimated that out of approximately 31.4 million people living in North-eastern India, about 8.1 million are tribal people of the hills and plains. Among four of the seven north-eastern states, tribal people are in majority. Arunachal Pradesh is made of approximately 24 major tribal groups, which constitute about 70% of the total population, Tripura 29% and in Assam constitutes 11%.

A total of 1726 cases were randomly selected in this study, out of which 1263 cases were from North-east India, namely from Arunachal Pradesh, Assam, Tripura and the rest were from West Bengal. Hematological parameters were estimated and agarose gel electrophoresis for identification of the Hb variants was performed. DNA was isolated, amplified and analysed by PCR-ARMS technology. The incidence of anemia among the tribal people of Assam was 59.82%, in Arunachal Pradesh 53.77% and Tripura 57.45%.

The presence of hemoglobinopathies and thalassemia account for anemia in a sizeable population of the north-eastern states in certain tribes and urgent health resources are needed to deal with this. HbE appears to be the commonest hemoglobin among the different tribes of north-east.

Keywords: *Anemia, hemoglobinopathy, tribal groups, North-east India*

Introduction

Anemia is a major health care problem in India. A multicentre study carried out by various agencies in the large multiethnic population of India has shown a high incidence of anemia in women and children [1]. The incidence ranges from 85% among pregnant women and 74.3% among children of age group 6 months to 35 months. Micronutrient deficiency has been considered a prime factor and efforts to reverse the problem have been initiated in several countries in South Asia, including India as part of the millennium development goals [2,3]. A subsequent search for abnormal hemoglobins has shown an incidence of 3.5–40% in different populations [4,5]. It has also been observed that coexistence of α and β thalassemia with abnormal Hb S and E display variability of phenotypic expression [6].

The screened population also includes some endogenous tribes who display high incidence of anemias due to HbE in association with α and β thalassemia. The coexistence of micronutrient deficiency and inherited anemias makes diagnosis delayed and management difficult. Our attempts in screening school children in several areas have increased awareness of inherited anemias popularizing premarital and prenatal screening.

Materials and methods

A total of 1726 cases were selected at random from eastern and north-eastern states like Assam, Arunachal Pradesh, Tripura and also from West Bengal. Detailed history including diet, family history of

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Table I. Distribution of cases.

	Name of place	Name of tribes	Number of cases
A.	Arunachal Pradesh	Gallong, Apatani, Miniyoung, Bokar, Tagin, Bori, Nishi, Ahom, Hillmiri, Pallibo	
1.	RKM School, Along		79
2.	IgoKato village		45
3.	RKM Hospital, Itanagar		179
4.	Narottam nagar		28
B.	Assam	Ahom, Garo	
1.	Dibrugarh University		73
2.	Parijat and Barbaruah village		161
C.	Tripura	Debbarman, Chakma, Jamatia, Adi, Tripuri, Riyang, Naotia	
1.	Villages		440
2.	RKM service centre, Dhaleswar		114
3.	School boys and girls		144
D.	West Bengal		
(i)	Midnapur district		
1.	Rohini School	Tribal	110
2.	Biribari, Nelue, Kontai, Basanti, Mukutshila	Tribal	58
(ii)	Hoogly district	Non-tribal	78
(iii)	Howrah district	Non-tribal	63
(iv)	North 24 parganas	Tribal and non-tribal	141
(v)	South 24 parganas	Non-tribal	13
	Total cases		1726

anemia and personal habits including tobacco and alcohol consumption were taken by questionnaire.

About 5 ml blood was drawn from each case. Hematological parameters including Hb%, PCV, MCV, MCH, MCHC were estimated by cell counter (Sysmex K 4500) and agarose gel electrophoresis for hemoglobin was performed for identification of Hb variants [7].

DNA was isolated from blood and PCR-ARMS technique was used for identification of β globin mutation [8].

Results

By using 11 g/dl of Hb as cut off point (the WHO standard for developing countries) 53.77% cases of Arunachal Pradesh, 57.45% of the population of Tripura and 59.82% cases of Assam were found to be anemic (Table II).

Although Arunachal Pradesh was found to have 53.77% of anemic cases, the prevalence of hemoglobinopathies is low and the high percentage of anemia can mostly be attributed to nutritional causes. Among the screened population of Arunachal Pradesh (total 331 cases), 79 were school children and 73 were village people and 179 cases were from Itanagar hospital.

Assam population was mainly (161 cases) from Garo and Ahom village and 73 cases were students of Dibrugarh University. In Tripura, 144 were student of Ramakrishna Mission (RKM) School and Tulsibati School for girls, 440 cases were from different villages (Table I). Prevalence of anemia among the boarders of different schools was less than amongst the village people. Anemia is more common in Ahom and Garo tribes and women of all the states.

HbE is common among the studied population of the north-east. About 50% of Assam population had HbE and Tripura had 55% HbE (Table III). β-thalassemia carrier were identified in about 5–6% in West Bengal whereas the incidence was negligible (0.3 and 0.43%) among tribal population of Arunachal Pradesh and Assam. As Tripura has a mixed population of Bengalis of eastern India and tribal groups, β-carrier is found among 3–4% cases.

Table II. Incidence of anemia among different population of Arunachal Pradesh, Assam, Tripura and West Bengal.

	Number of cases	Hb < 11 gm%	Hb > 11 gm%	Anemic (%)
Arunachal Pradesh	331	178	153	53.77
Assam	234	140	94	59.82
Tripura	698	401	297	57.45
West Bengal	463	208	255	44.92
Total	1726	927	799	53.71

Table III. Report of abnormal hemoglobin.

Electrophoretic report	Arunachal Pradesh	Assam	Tripura	West Bengal
Normal	263 (79.46%)	114 (48.72%)	262 (37.54%)	405 (87.47%)
Beta carrier	1 (0.30%)	1 (0.43%)	25 (3.58%)	24 (5.18%)
HbE carrier	61 (18.43)	81 (34.61%)	286 (40.97%)	26 (5.61%)
Homozygous E	5 (1.51%)	36 (15.38%)	107 (15.33%)	1 (0.21%)
E Beta			10 (1.43%)	2 (0.43%)
Beta thal			5 (0.72%)	1 (0.21%)
HbS carrier	1 (0.30%)	1 (0.43%)	–	2 (0.43%)
ES (compound heterozygote)	–	1 (0.43%)	3 (0.43%)	–
HbH	–	–	–	2 (0.43%)
Total	331	234	698	463

IVS-1nt 5 mutation was found in most of the β carrier and β thalassemia cases.

Discussion

The population studied was large but lived in isolated rural villages distributed sometimes over difficult terrain. The clinical severity of the condition varied in populations where there is coexistence of α thalassemia, β thalassemia or other hemoglobinopathies in association with iron deficiency anemias [5,6].

The incidence of HbE is high especially among tribes of Tripura and Assam [4]. The presence of α thalassemia among the tribal groups of Arunachal Pradesh, Assam and West Bengal were of 3.7 and 4.2α deletional type [6]. Anemia due to hemoglobinopathies is more common in Assam and Tripura but nutritional anemia is more prevalent among the Arunachal Pradesh cases.

Maternal undernutrition is closely related to the development of low birth weight babies, who are at risk of mortality and also at risk of CHD and hypertension, diabetes and obesity later on in life [9]. Low hemoglobin concentration is also related to higher risk of miscarriages, preterm birth and low birth weight. Therefore, nutritional intervention in the women of childbearing age is most important toward the overall development of the community.

All these tribes are distinct and practice clan exogamy and community endogamy so that genes tend to localise in areas which are also distantly placed. Some tribes are highly educated and easily motivated to consider individual and population health issues. Our prime objective was to provide counselling and prevention of anemia and spread of genetic diseases. Marriages between HbE and β thalassemia carriers give rise to severe HbE/β thalassemia syndrome. If pre-marital counselling is not provided the number of EE and E-β cases will increase progressively in the succeeding generation. The only way to check the explosion of cases is to provide pre-marital and pre-conceptual counselling. We believe that our study provides the background information to allow intelligent discussion and individual choice in hemoglobinopathy screening.

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