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Comparative Study of Haemoglobinopathies in Tribal Populations of Arunachal Pradesh and Tripura (North East India)

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ABSTRACT Screening of unrelated adolescent school children in two states of North East India- Tripura and Arunachal Pradesh- have shown presence of HbE as the major abnormal Hb in 78.05% 0f 196 children in Tripura- an incidence which was reported earlier in general population of the same area (65.01%). Our first report of tribes of Arunachal Pradesh- the north-eastern most state- shows a lower incidence of HbE (5.6% of 83 children). The value of screening of young adolescents in areas of high incidence of haemoglobinopathies cannot be overemphasized.

INTRODUCTION

In the seven North Eastern states of India the majority of the population comprise of tribes mostly of Tibeto-Mongoloid stock. Nagaland, Meghalaya, Arunachal Pradesh and Mizoram have the highest percentage of tribal populations, while Assam, Tripura and Manipur show admixture with the surrounding Tibetan, Bengalee and Bangladeshi populations. The fact that both these populations have a high incidence of β-thalassaemia causes the development of Eβ thalassaemia disease which is a severe condition, producing serious effects[1,2,3,4]. Bioanthropological data are available for some but not all tribes[5,6,7,8]. In India, in most populations, subcastes and tribes, the high incidence of various abnormal haemoglobins has been noted[9]. The populations of some states of the North East, specially Arunachal Pradesh, however have not been fully studied due mainly to the difficulty of access to small villages and multiple subtribes who are almost without health care services (Anthropological Survey of India, 1995)[7] and show similarity with Tibeto Burman populations. The work has mainly been directed to study the normal genetic variations and blood groups as well as serum protein polymorphisms. Disease incidence variations have not been encountered to the same degree due mainly to the absence of medical research and screening facilities in tribal areas.

Our work in Tripura among unrelated tribes of all age groups have shown a rise in the incidence of HbE in younger populations. There has also been a rise in the incidence of Eβ cases mainly among persons of Bengalee/ Bangladeshi origin pointing to a future public health problem.

MATERIALS AND METHODS

Screening of adolescent school children has been undertaken in tribal populations of Tripura and Arunachal Pradesh. The samples were collected after prior intimation to the guardians which usually were preceded by public meeting and get-togethers explaining the enormity of the problem. A free health check-up and investigations and reporting of Haematocrit and ABO blood grouping were also given free to enable follow-up and counselling if necessary. Especially in Arunachal Pradesh, since the children are well conversant in English, they responded eagerly and appeared to have basic knowledge of genetic diseases imported in their school curriculum. The height and weight were measured as well as general medical check-up was done. Venous blood was collected in ACD and EDTA vacutainers. The following test were carried out: ABO and Rh blood grouping, HCT, Agarose Gel Electrophorasis for HbE and S, HbF by alkali denaturation test, column chromatography for HbA and A_2. DNA analysis in diagnosed cases was carried out using PCR-ARMS method.

RESULTS AND DISCUSSION

Tripura Tribals

Total persons screened of all age groups were

310, of whom 196 were school children. The major group belonged to the Tripuri (Deb Barman) tribe, while Chakma, Jamatiya, Rupini, Aslong, Dangsha, Kalai and other tribes were also tested.

The results of screening showed HbE inheritance in majority (142) as carriers (45.8%) and homozygous E (14.83%). Only 78 (25.16%) were normal. Among school children 57.65% were HbE carrier and 20.40% were homozygous E. There was a rise°•$#the incidence over our previous survey of population of the same area where unrelated persons of all ages had been tested[1,3]. There were also 12 (3.87%) HbEβ thalassaemics and 6 (1.93%) β-thalassaemia (Table 1). The individual tribes did not show any difference. Chakmas who are considered of Bangladeshi origin showed 8 out of 9 children with HbE trait while the Jamatias also showed 8 carriers of HbE out of 9 children. The adi Tripuris, Dewan, Riang and Naotia tribal sampling was low 5, 4, 3 and 2 children, respectively and displayed the same picture.

The Hb% of HbE in West Bengal has been almost normal in previous reports but many cases of HbE homozygotes had a low Hb (10±1 gm%) compared to normal or carriers (11-13 gms%). HbE haplotype studies carried out have shown that West Bengal and Tripura populations are different showing separate mutations[4].

Table 1: Different Haemoglobinopathies in the tribal population of Tripura
Total number of cases = 310

Types	*Number of cases*	*Percentage*
β carrier	26	8.38
HbE	142	45.80
HbE homozygous	46	14.83
Eβ	12	3.87
β thalassaemia	6	1.93
Normal	78	25.16

Total number of school children = 196

Types	*Number of cases*	*Percentage*
HbE	113	57.65
HbE homozygous	40	20.40
Normal	43	21.93

Arunachal Pradesh Tribals

The Arunachal Pradesh population varied from the Tripura population in being physically in much better shape despite a more difficult and strenuous lifestyle and low population density. In possibly the first reported screening of adolescents – unrelated boys belonging to twenty one different tribes were screened. Of these 83 (93.25%) showed no abnormality and a Hb% of 13.31 mean value with 2.51 mean HbA_2 and 0.74% HbF. There were 5 (5.61%) carriers and one Eβ-thalassaemia with Hb 10.1 HbE 71.4% and HbF 12.5% (Table 2). HbE occurred in only 5 of which one each was found in Galong (out of 7), Apatani (1 of 9), Singphoo (1 of 3), Tagin (1 of 3) and Tangsa (1 of 7) (Table 3). The single Eβ-thalassaemia was in a boy of probable Assam tribal/Arunachal Pradesh tribal origin Senbaya Deori caste and except for a Hb% of 10.1 gm% has little clinical manifestations. Study of Arunachal Pradesh tribals gives a picture of little admixture but the presence of HbE is disquieting. HbE has been reported in general populations of Adi, Apatani and Nishi tribes[10] and is likely to be maintained by clan endogamy. The single β-thalassaemia mutation has not been identified to belong to any of the known 12 mutations usually screened for by us. It may be noted here that 'unknown' β mutants occur in about 10-12% of the total persons tested for in most laboratories and also in our laboratory. Some of these have been tested and found to be unique[11].

Molecular analysis of the HbE codon 26 presents a uniform picture but haplotyping has shown the Tripura, Arunachal Pradesh and West

Table 2: Hb variants in Arunachal Pradesh (Total - 89)

Types	*Total no.*	*Hb (gm %) (mean)*	*HbA2 % (mean)*	*HbE % (mean)*	*HbF % (mean)*
Normal	83 (93.25%)	13.31	2.51	-	0.74
E carrier	5 (5.61%)	12.54	-	22.46	0.82
Eβ	1 (1.12%)	10.1	-	71.4	12.5

Table 3: Incidence of HbE in different tribes of Arunachal Pradesh

Types	*Total no.*	*Hb (gm%) (mean)*	*HbA2% (mean)*	*HbE% (mean)*	*HbF% (mean)*
Apatani	9				
Normal	8	13.27	2.63	-	-
E	1	13.2	-	22.4	0.4
Galong	7				
Normal	6	12.62	2.68	-	-
E	1	11.0	-	20.3	1.2
Singphoo	3				
Normal	2	13.45	3.0	-	-
E	1	12.7	-	27.1	0.6
Tagin	3				
Normal	2	14.70	2.4	-	-
E	1	13.6	-	24.2	1.0
Tangsa	7				
Normal	6	13.6	2.5	-	-
E	1	12.2	-	18.3	0.9

Bengal mutants to be different[12], suggesting multiple origins.

It is apparent therefore that mutations of the β globin gene are continuous and maintained in population by founder gene effect specially in endogamous tribal populations. As HbE has a milder expression, it is gradually increasing in the population as has been observed in our repeat study in Tripura. In Thailand school children are screened regularly to counsel against a high HbE[13]. The highest incidence of HbE has been reported in population of Thailand necessitating screening of school children[14]. This procedure in the Eastern states of India is yielding good results. Our studies bear out the necessity of screening of school children and young adolescents for HbE and β-thalassaemia in the population of North East India.

Such a procedure is required to be taken up in the tribes of North East India for prevention of uncontrolled rise in the population as has been observed in Tripura.

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