Hum Hered 1991;41:84-88

High Prevalence of Haemoglobin E in Three Populations of the Malda District, West Bengal, India

M.K. Das, B. Dey, M. Roy, B.N. Mukherjee

Anthropometry and Human Genetics Unit, Indian Statistical Institute, Calcutta, India

Key Words. Haemoglobin E · Population study · India

Abstract. High frequencies of haemoglobin (Hb) E were reported earlier from Assam in northeast India. In the present study one of the three populations of the Malda district of West Bengal, called the Deshi, was found to show one of the highest incidences of the Hb E gene (0.61) recorded so far. A founder effect and/or local inbreeding may possibly explain this observation.

Introduction

Some populations of the Tibeto-Burman-speaking Bodo ethnic group residing in Assam have shown the highest frequency (0.64) of the haemoglobin E (Hb E) gene [Deka et al., 1988], so far, in the world. There are alternative hypotheses regarding the origin, spread and maintenance of the gene in southeast Asia and in northeast India. Until recently, the hypothesis of the single Hb A → Hb E mutation and its spread from southeast Asia was generally accepted. It was believed to be maintained through an adaptive advantage in the malarious environment [Flatz, 1967; Flatz et al., 1972; Kruatrachue et al., 1969], but a higher incidence of the gene (0.4-0.6) among the Bodo populations than among the populations speaking Austroasiatic or Thai languages - the Khasi and the Ahom (0.3-0.4), who could have carried the gene from Thailand or from Shahn in Burma - could not be explained by this hypothesis. The demographic analyses of some Bodo populations have suggested different selective mechanisms in Assam and in Thailand [Deka, 1981; Das and Deka, 1985; Deka et al., 1988]. On the other hand, there are reports on two different mutations of Hb E with two different DNA frameworks [Antonarakis et al., 1982; Hundrieser et al., 1988]. In this report the results of a study of the Hb E gene frequency in three endogamous populations of the northern part of West Bengal, who are offshoots of the Bodo group, are discussed in the light of this background knowledge.

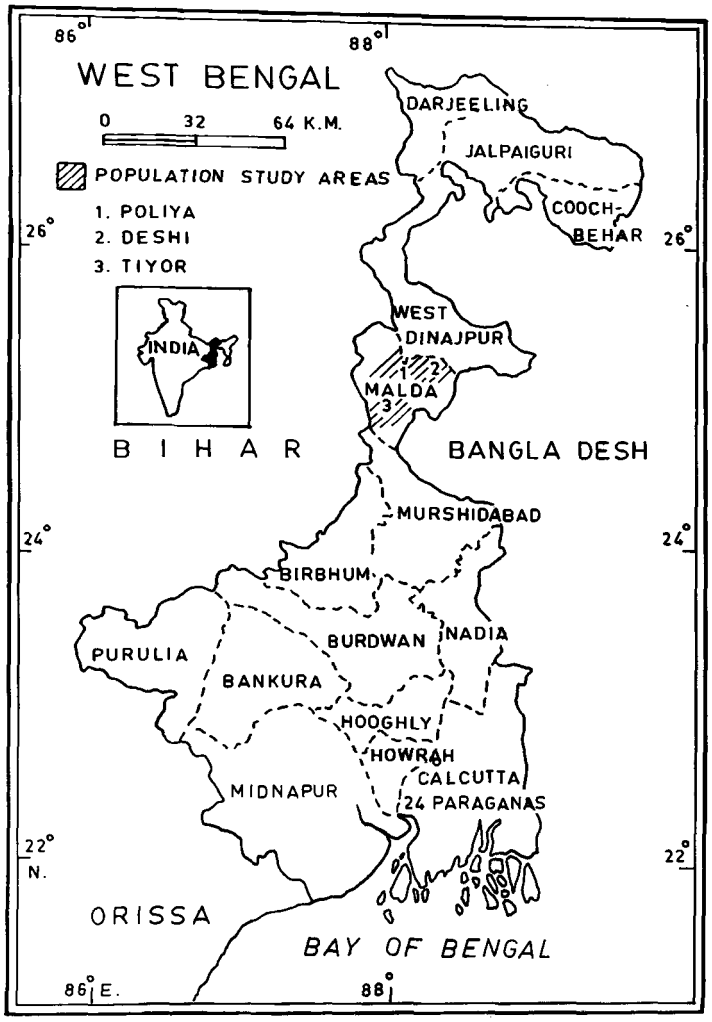

Fig. 1. Map of West Bengal, showing the distribution of the populations under study.

Material and Methods

The Poliya, Deshi and Tiyor populations have originated from the Koch ethnic group of the northern part of the present West Bengal (fig. 1) and Assam states who are described as one of the most ancient peoples of India [Dalton, 1872]. The Poliya and the Deshi are Bengali-speaking populations and follow village exogamy. The Tiyors speak 'Khotta or mixed Hindi dialect'. There are two subdivisions of the Poliya, known as Sadhu Poliya and Babu Poliya, and the Deshi are one of the subcastes of Sadhu Poliya. The Sadhu Poliya are traditionally horticulturists, and the Deshi are settled agriculturists who claim a superior status. The Tiyor form a subcaste of the Rajbanshi - a new name adopted by the Koch [Risley, 1891; Sanyal, 1965]. Their traditional occupations are fishing and plying of boats, though some of them are now engaged as agricultural labourers.

Blood samples from 85 unrelated Sadhu Poliya, 103 Deshi and 95 Tiyor, i.e. a total of 283 apparently healthy individuals belonging to both sexes, were

collected in EDTA by finger pricks from March to June 1987. The haemoglobin types were screened by electrophoresis on starch gel and on cellulose acetate strips in parallel along with known control samples. The differentiation between Hb E and Hb A_2 was verified by the analysis of globin chains in cellulose acetate paper using Tris-EDTA-borate with citrate-urea buffer at pH 6.0.

Results

The results of this analysis in the three populations (table 1) showed a very high incidence of Hb E allele among the Deshi and the Poliya. A significant deviation from the genetic equilibrium was observed in the Poliya sample ($p = 0.15$) with an excess of heterozygotes. In the Deshi sample a very high frequency of the E gene was observed, but in the Tiyor sample the E frequency was low.

The three populations show significant differences in their distribution of Hb E frequencies ($p < 0.001$). Even the Deshi and the Poliya, who have close ethnic affinities, differ significantly ($p < 0.03$). When the present data are compared with those from some Mongoloid populations of Assam and West Bengal (table 2), the Deshi population does not differ significantly from the Bodo-Kachari and Rabah of Assam but the Poliya show a significantly lower Hb E gene frequency than that of the Bodo-Kachari population. The Deshi population shows significantly higher Hb E frequencies than that of the Ahom. On the other hand, the Tiyor do not differ significantly from the Rajbanshi and Mech populations of northern West Bengal, possibly due to their admixture with the neighbouring caste populations.

Table 1. Distribution of Hb E in three populations of the Malda district, West Bengal

Population	Haemoglobin type				Hb E gene frequency	χ^2 value
	N	AA	AE	EE		
Poliya	85	17	52	16	0.494	5.86
Deshi	103	17	46	40	0.612	0.47
Tiyor	95	73	20	2	0.126	0.44

Table 2. χ^2 values of comparison between Poliya, Deshi and Tiyor with some Mongoloid populations of Assam and West Bengal (in parentheses Hb E gene frequencies)

Population	Present study			References
	Poliya (0.494)	Deshi (0.612)	Tiyor (0.126)	
Bodo-Kachari (0.645)	9.062	0.528	-	Deka et al., 1988
Ahom (0.403)	3.312	19.158	40.221	Deka et al., 1988
Rabah (0.535)	2.728	2.732	-	Das and Deka, 1980
Rajbanshi (0.230)	-	-	7.222	Deka et al., 1988
Rajbanshi (0.103)	-	-	0.402	Mukherjee et al., 19
Mech (0.173)	-	-	0.759	Mukherjee et al., 19

Discussion

The Deshi population of the Malda district, though living far away from the high frequency area for Hb E in Assam [Das and Deka, 1985; Deka et al., 1988], exhibits one of the highest known incidences of the Hb E gene in the world along with the Bodo-Kachari [Deka et al., 1988], with whom it has ancestral affinities. There is, however, no evidence of a recent admixture between these populations. The results of the present study do not conform to the hypothesis of adaptation to malaria [Flatz, 1967; Kruatrachue et al., 1969] in view of the following facts: (1) a significant increase in Hb E among the Deshi compared to the ancestral population of the Poliya, who have lived in a similar environment for a long time; (2) the frequency distributions of Hb E in successive age groups do not indicate any change, although a malaria control programme has been operating successfully since the 1950s, and (3) the Tiyor show a very low frequency of Hb E despite their common ancestry and similar geographical environment. Ethnohistorical information and cultural comparisons indicate that both the Poliya (including the Deshi) and the Tiyor populations are offshoots of the Koch tribe, which again is a branch of the Bodo group of population spread over the plains of Assam and the northern part of West Bengal.

The genotypic frequencies in the agricultural Deshi population which displays the highest E gene incidence do not appear to deviate from genetic equilibrium. There is no suggestion that the Hb E polymorphism is transitional in the Deshi and there is no clear-cut indication of any selection mechanism operating in this population. The caste endogamy in a limited area and a founder effect might have led to a greater increase in the Hb E frequency among the Deshi population than in the Poliya, who are widely dispersed in the adjacent districts of Malda and West Dinajpur.

Acknowledgement

This work is partly supported by the award of a Research Associateship of UGC to M.K.D.

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Prof. B.N. Mukherjee
Anthropometry and Human Genetics Unit
Indian Statistical Institute
203 B.T. Road
Calcutta-700 035 (India)