

Distribution of Red Cell H Substance Among the Muslims of Calcutta

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ABSTRACT A total of 285 individuals from Bengalee and Non-Bengalee Sunni sect Muslim community of Calcutta, West Bengal has been typed for A_1A_2BO blood groups and H substance on the red cells. The distribution and gene frequencies of H substance shows a considerable variability ($p < 0.001$) between these two Muslim communities of Calcutta.

INTRODUCTION

Since the publication of Schiff (1927), serum which strongly reacts with O and A_2 blood groups of A_1A_2BO system than the other phenotypes was subsequently termed as H substance (Eisler, 1930). In the later periods extensive work with regard to strong agglutination with O and A_2 blood groups has also been investigated (Schiff, 1935; Gammelgaard, 1942).

Biochemical structure of H antigen on the basis of its alcohol and water solubility for the terminal polysaccharides identity was investigated by a number of authors (Watkins, 1966; Morgan and Watkins, 1969; Morgan, 1970).

Variable distribution of H antigen in red cells was pointed out in many population studies from different parts of the world (Wiener et al., 1945; Saldhana et al., 1960; Hassan et al., 1968; Mourant et al., 1968; Harrison et al., 1969; Marengo-Rowe et al., 1974). A discrete variation in the presence of H antigen in red cells and saliva was found in the populations of Africa and America (Solomon et al., 1965; Mourant et al., 1976).

Utility of anti-H in the detection of the 'Bombay blood' group was first reported by

Bhende et al. (1952), and subsequently the explanation was forwarded by Ceppellini (1959) and Watkins (1967).

In the Indian context, Bhatia (1966), Bhatia et al. (1955), Bhatia and Sanghvi (1962) provided elaborate discussion on the issue of distribution and genetics of H antigen.

Although the blood group distribution in Muslims of Calcutta was studied (Banerjee and Hoque, 1991), the information on red cell H antigen distribution among them is incomplete. The present work, is an attempt to fill this void.

MATERIAL AND METHODS

The material for the present study comprised of 285 blood samples 158 males and 127 females of Bengalee and Non-Bengalee Sunni sect Muslim community from Calcutta. The samples were collected from the Muslim schools as well as from different Muslim families of Calcutta, West Bengal.

Blood samples were collected by finger puncture method in EDTA vials and transported to Physical Anthropology and Human Genetics Laboratory, Department of Anthropology, University of Calcutta for the investigation of A_1A_2BO blood groups and red cell H substance. Studies on red cell H antigen and A_1A_2BO

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Table 1: Distribution of the A₁ A₂ BO blood groups and allele frequencies among the Bengalee and non-Bengalee Muslims

Population	Phenotypes						Allele Frequencies				
	O	A ₁	A ₂	B	A ₁ B	A ₂ B	A ₁	A ₂	B	O	
Bengalee Muslims:											
Male (M)	118	38 (32.20)	26 (22.03)	2 (1.70)	40 (33.90)	12 (10.17)	—	0.167	0.015	0.247	0.571
Female (F)	107	35 (32.71)	22 (20.57)	—	43 (40.19)	7 (6.53)	—	0.156	—	0.279	0.565
Total	225	73	48	2	83	19	—	0.162	0.010	0.262	0.568
Non-Bengalee Muslims:											
Male (M)	40	13 (32.50)	7 (17.50)	1 (1.50)	14 (35.00)	5 (12.50)	—	0.136	0.020	0.258	0.584
Female (F)		7 (35.00)	5 (20.00)	3 (15.00)	4 (20.00)	1 (5.00)	—	0.156	0.114	0.148	0.583
Total	60	20	12	4	18	6	—	0.143	0.056	0.220	0.581

Figures in parentheses are percentages

χ^2_4 —Bengalee Muslim Males vs Non-Bengalee Muslim Females = 3.55, $p>0.30$

Non-Bengalee Muslim Males vs Non-Bengalee Muslim Females = 3.69, $p>0.30$

Bengalee Muslims (M+F) vs Non-bengalee Muslims (M+F) = 1.18, $p>0.50$

blood groups were done by following the standard methods (Boorman et al., 1977).

Determination of allele frequencies was done of by maximum likelihood estimation and heterogeneity chi-square analysis was performed to seek inter-group differences.

RESULTS AND DISCUSSION

Distribution of the A₁A₂BO blood groups of non-Bengalee and Bengalee Sunni sect Muslims of Calcutta, according to sex has been presented in table 1. No sex differences were found among the Bengalee and non-Bengalee Muslim populations. Although a slightly higher frequency of A₂ allele among the non-Bengalee Muslims and slightly higher frequency of O allele among the Bengalee Muslims were found, but the overall heterogeneity in the distribution of the A₁A₂BO blood groups was not marked $\chi^2 = 1.18$, 5 d.f. $p>0.20$. The distribution of the ABO blood groups shows good agreement with the earlier studies on Muslims of Calcutta (Greval and Chandra, 1940; Das et al., 1953).

Examination of the distribution of red cell H antigen among the Bengalee and non-Bengalee Muslims showed no sex differences (Table 2). Significantly higher *h* allele frequency was found among non-Bengalee males ($\chi^2 = 11.74$; 1 d.f. $p<0.001$) as well as females ($\chi^2 = 13.66$; 1 d.f. $p<0.001$) compared to their Bengalee counterparts. Consequently, a significant heterogeneity in the distribution of red cell H antigen was found ($\chi^2 = 23.86$, 1 d.f. $p<0.001$) between the Bengalee and non-Bengalee Muslims of Calcutta.

Finding of higher recessive *h* allele in non-Bengalee Muslim population seems to be related with their higher incidences of consanguineous marriages (Table 3) compared to the Bengalee Muslims of Calcutta (Race and Sanger, 1960). The fixation index (*F*) for the ABO locus was also found to be higher in non-Bengalee Muslims (0.0241) than the Bengalee Muslims (0.0091) of Calcutta. Higher consanguineous marriages in the form of 1st cousin marriages were reported earlier also from Calcutta among the non-Bengalee Muslims (Basu, 1985). The present study thus calls for attention of

Table 2 : Distribution of red cell H antigen among the Bengalee and non-Bengalee Muslims of Calcutta

Population	N	Phenotypes												Allele frequencies						
		O						A ₁						A ₂ B						
		H ⁺	H ⁻	H ⁺	H ⁻	H ⁺	H ⁻	H ⁺	H ⁻	H ⁺	H ⁻	H ⁺	H ⁻	H ⁺	H ⁻	Total	H ⁺	H ⁻	H	h
Bengalee Muslims :																				
Male	118	38	—	24	2	2	—	39	1	11	1	—	—	—	—	114	4	0.815	0.185	
%	32.21	—	—	20.34	1.69	1.69	—	33.05	0.85	9.32	0.85	—	—	—	—	96.61	3.39			
Female	107	35	—	20	2	—	—	41	2	6	1	—	—	—	—	102	5	0.783	0.217	
%	32.71	—	—	18.69	1.87	—	—	38.32	1.87	5.61	0.93	—	—	—	—	95.33	4.67			
Total	225	73	—	44	4	2	—	80	3	17	2	—	—	—	—	216	9	0.799	0.201	
%	32.44	—	—	19.56	1.78	0.89	—	35.56	1.33	7.55	0.89	—	—	—	—	95.99	4.01			
Non-Bengalee Muslims :																				
Male	40	13	—	5	2	1	—	11	3	2	3	—	—	—	—	32	8	0.552	0.448	
%	32.50	—	—	12.50	5.00	2.50	—	27.50	7.50	5.00	7.50	—	—	—	—	80.00	20.00			
Female	20	6	1	3	2	3	—	2	2	—	1	—	—	—	—	14	6	0.452	0.548	
%	30.00	5.00	5.00	15.00	10.00	15.00	—	10.00	10.00	—	5.00	—	—	—	—	70.00	30.00			
Total	60	19	1	8	4	4	—	13	5	2	4	—	—	—	—	46	14	0.517	0.483	
%	31.66	1.67	13.33	6.67	6.67	6.67	—	21.67	8.33	3.33	6.67	—	—	—	—	76.67	23.33			

Table 3 : Consanguineous marriages and co-efficient of inbreeding among the Bengalee and non-Bengalee Muslims of Calcutta

Population	No. of marriages	Paternal cousin marriages			Maternal cousin marriages			Total cousin marriages	Co-efficient of inbreeding
		Fathers brother's Daughter	Father's sister's daughter	Mother's brother's daughter	Mother's sister's daughter				
Bangalee Muslims	225	8 (3.56)	4 (1.78)	11 (4.89)	3 (1.33)	3 (1.33)	3 (1.33)	29 (12.89)	0.0074
Non-Bengalee Muslims	60	4 (6.67)	1 (1.67)	5 (8.33)	3 (5.00)	3 (5.00)	1 (1.67)	14 (23.33)	0.0138

Figures in parentheses are percentages

screening of red cell H antigen in more Muslim populations.

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