

A Study on Fetal Wastage and Blood Groups in a Bengalee Population

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ABSTRACT In the present paper, blood samples of abortive parents (992) and parents of the newborn (1814) were studied for the ABO blood groups. Abortive mothers and their husbands showed heterogeneity in the distribution of this blood group system. The distribution of the fetal death and newborns was found to be statistically significant between the ABO compatible and the ABO incompatible matings.

INTRODUCTION

Selection adjudicated by relative fitness of the genotype determines their incidence in the next generation. Selection effects on a genotype both at the prezygotic and postzygotic stages are generally manifested as disorder related pregnancy. Impaired pregnancy outcome is thus accounted for as strong force for selective elimination of unfit genotypes during prenatal period. Most effective means of selection against heterozygote arising out of ABO incompatibility between mother and fetus has been recorded by many authors (Levine, 1943; Kirk et al., 1955; McNeil et al., 1954; Chung and Morton, 1961; Matsunaga, 1962; Hiraizumi et al., 1973; Chakravarti and Chakravarti, 1977; Satyanarayan et al., 1978; Banerjee and Das, 1986). Most of the evidences of fetal wastage were based either on data of the ABO blood groups of abortive mothers, or on data of ABO matings among the abortive couples with one or more fetal wastage. Excess of ABO incompatibility matings among them over the expected numbers was found by several authors; besides that an increased number of early fetal loss in ABO incompatible matings, as compared to that of the compatible ones, was also noted.

In the present study, an attempt has been made

to investigate the effect of the ABO system on fetal wastage, with a comparison with control newborns in a Bengalee Hindu population.

MATERIAL AND METHODS

Subjects for the present study comprised abortive parents (615 mothers and 341 fathers) and 1814 parents of the newborns. Blood samples of the parents of the newborns and in most cases of the expectant mothers and in most cases of their husbands were collected from Ramakrishna Mission Seva Pratishthan Hospital (Vivekananda Institute of Medical Sciences) Calcutta. Blood samples of abortive mothers were collected at the time of admission or subsequently during their stay in the hospital. Mothers were requested for their blood samples and complied with request. Only spontaneous abortion cases were included, since this hospital is under the management of Ramakrishna Mission, a well known Monastic organisation of Ramakrishna-Vivekananda Order, an Medical Termination of Pregnancy (MTOP) is totally absent.

Blood samples were immediately put in ice buckets and transported to the Physical Anthropology and Human Genetics Laboratory,

Table 1: Distribution of ABO blood groups and gene frequencies among the abortive parents and parents of the newborns

	n	Blood groups				Gene frequencies		
		O	A	B	AB	A	B	O
Abortive Mothers	651	225	137	245	44	0.151	0.255	0.594
	%	34.56	21.04	37.64	6.76			
Abortive Fathers	342	98	90	119	34	0.203	0.258	0.537
	%	28.74	26.39	34.90	9.97			
Abortive Parents	992	333	227	364	78	0.168	0.256	0.576
	%	33.56	22.88	36.69	7.87			
Newborn's Mothers	1000	338	213	378	71	0.157	0.260	0.585
	%	33.80	21.30	37.80	7.10			
Newborn's Fathers	914	279	168	305	62	0.153	0.259	0.588
	%	30.53	18.49	33.37	6.78			
Newborn's Parents	1814	617	381	683	133	0.148	0.259	0.587
	%	34.01	21.01	37.65	7.33			

Table 2: The ABO couple combination among the parent of the aborted fetus and newborns

Mating type		Aborted fetus		Newborns	
		Number	Per cent	Number	Per cent
Compatible					
Mother	Father				
O	O	30	17.04	99	17.40
A	O	18	10.23	52	9.14
B	O	39	22.16	109	19.16
AB	O	11	6.25	17	2.99
A	A	19	10.85	71	12.48
B	B	44	25.00	183	32.16
AB	AB	2	1.34	4	0.70
AB	A	8	4.54	23	4.04
AB	B	5	2.84	11	1.93
Total		176	100.00	569	100.00
Incompatible					
Mother	Father				
O	A	32	19.39	41	16.73
O	B	42	25.45	91	37.15
O	AB	19	11.52	8	3.26
B	A	31	18.79	36	14.69
A	28	16.97	29	11.84	
A	AB	2	1.21	26	10.61
B	AB	11	6.67	14	5.72
Total		165	100.00	245	100.00

ment of Anthropology, University of Calcutta, where ABO blood grouping was performed according to the standard methods (Boorman et al., 1977) by agglutination test. Gene frequen-

cies were estimated using the square root formula and method of maximum likelihood. Contingency χ^2 test (Fisher, 1934) was applied for 'goodness of fit'.

RESULTS AND DISCUSSION

It is apparent from Table 1 that the distribution of the ABO blood groups showed no heterogeneity between the mothers of the newborns and the fathers of the newborns ($\chi^2 = 0.30$, $P > 0.50$). On the other hand, heterogeneity was evident between the abortive fathers and the abortive mothers ($\chi^2 = 8.52$, $P < 0.05$).

Although abortive fathers and the fathers of the newborns showed heterogeneity in the distribution of the ABO blood groups ($\chi^2 = 7.85$, $P < 0.05$), the two groups of parents, however, were found to be homogeneous ($\chi^2 = 1.85$, $P > 0.50$). Couple combinations (Table 2) showed significant difference between the ABO compatible and the ABO incompatible matings, with respect to the incidences of aborted fetus and newborns ($\chi^2 = 35.11$, $P < 0.001$).

It evident from table 2 that fetal loss due to ABO incompatibility was found to be highest among the O group mothers (56.36%), which is corroborative with the contention of the findings of several authors (Wren and Vos, 1961; Reed et al., 1964; Kircher, 1965; Morton et al., 1966). Moreover, examination of this table revealed the fact of elimination of heterozygotes in the form of fetal wastage in O mothers and non-O fathers, which leads to mortality of genotypes (Weiner, 1942), distortion in segregation ratios of differential fertility of different genotypes for the maintenance of polymorphism in blood groups, especially of the ABO system (Vogel and Motulsky, 1982).

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