

Antibody Titres in ABO Blood Groups and Maternal Fetal Incompatibility

Rekha Jain, Adarsh Bhargava and Neelam Bhardwaj

Dept. of Gynaec. & Obst., Zanana Hospital & S.M.S. Medical College, Jaipur (Rajasthan)

Summary

HDNB due to ABO incompatibility is the commonest but milder disease compared to Rh incompatibility. An incidence of 9.43% of ABO-HDNB was found in this study. Highest incompatibility rate (44.2%) was seen in O group mothers and maximum group A neonates were born to incompatible mothers. Anti-A titres were higher in group B mothers in both compatible as well as incompatible combinations. Sixty percent of the titres were above 1:256 in incompatible combinations. Anti-A titres were lower than Anti-B titres in O group mothers. In general low cord blood antibody titres of the new born compared to maternal blood indicated low immunoglobulin production in the new born.

Out of total 300 cases under study only five neonates had ABO-HDNB with the appearance of jaundice within 24 hrs. Sixty percent were born to primigravidae because of naturally occurring antibodies. Incidence was higher when a neonate with A group was born to mother of O group (80%).

Introduction:

ABO incompatibility is the most common cause of hemolytic disease of the new born but major blood group incompatibility (ABO) between mother and foetus usually results in milder disease than does Rh incompatibility.

ABO incompatibility is caused by the reaction of maternal Anti-A or Anti-B antibodies to the A or B antigen on the red cells of the foetus or newborn. It is usually seen only in A or B infants born to type O mothers because these mothers have naturally occurring Anti-A or Anti-B antibodies of the Ig G class, which cross the placenta and destroy the foetal cells. Maternal antibody may be formed against B cells if the mother is type A or against A cells if the mother is type B, but these A or B type mothers usually make Anti-A or Anti-B antibodies of the Ig M class which do not cross the placenta (Nelson 1992).

Material And Methods:

The present study was conducted upon 300 cases admitted in State Zanana Hospital attached to SMS medical college, Jaipur from October 1994 to March 1995. Only Rh-positive blood group mothers were included in the study, without having any medical disease or special immunological problems.

Blood samples from 300 mothers and cord blood samples of their newborn infants, 5ml from each, were collected. Serum was separated after clot retraction and subjected to determination of titres for antibody A and B in group A, B and O individuals. From clotted blood, RBC's were obtained by dislodging the clot gently and washed thrice with buffered saline and 2% cell suspensions were prepared with buffered saline and used for typing of ABO blood groups with Ethnor antisera. Since the frequencies with certain titres were low for comparisons the samples

were categorized into three groups i.e. those with (a) Low titres (<1:8) (b) Medium titres (1:16 to 1:128) and (c) High titres (> 1:256). New borns were also investigated for Hb % and bilirubin levels.

Observations and Discussions:

In the present study we had highest number of mothers with blood group O (40%). The number of babies with blood group O (34.3%) was also highest. Maximum group A neonates were born to incompatible mothers i.e. out of 83 group A neonates 66.2% were born from incompatible mothers i.e. mothers with blood group O or B (Table I). Similar trend was observed by Padma et al (1994) and Dhamgaye and Gupta (1987), but according to Raha et al (1977), incompatible babies were more of group B.

The highest incompatibility rate (44.2%) was seen in O group mothers in the present study as they have naturally occurring IgG antibodies against group A and B which cross the placenta and cause HDNB. Same observations were reported by Gupte et al (1973), Desjandins et al (1979), Jain et al (1983), Dhamgaye et al (1987) and Padma et al (1994). Higher incompatibility

Table II
Distribution of compatible and incompatible offsprings.

Mothers	Neonates				Total
	Compatible		Incompatible		
	No.	%	No.	%	
Group A	43	58.1	31	41.9	74
Group B	70	70	30	30	100
Group O	67	55.8	53	44.2	120
Group AB	6	100	-	-	6
Total	186	(62%)	114	(38%)	300

Male neonatal population (61.3%) had an upper hand as compared to the number of female neonatal births (38.7%) in all the blood groups of mother and child, although incompatibility was comparatively more with female fetuses, reconfirming them as stronger genetic sex.

Anti-A titres were higher in group B mothers in both compatible as well as incompatible combinations. 60% of the titres were above 1:256 in incompatible combination. In blood group A mothers although Anti-B titres were more in both compatible and incompatible fetuses, 88% were limited to less than 1:128. These

Table I Frequencies of ABO blood groups in mothers and their neonates.

Mothers	Neonates								Total	
	Group A		Group B		Group O		Group AB		No.	%
	No.	%	No.	%	No.	%	No.	%		
Group A	28	37.8	25	33.8	15	20.3	6	8.1	74	(24.7)
Group B	25	25	49	49	21	21	5	5	100	(33.3)
Group O	30	25	23	19.2	67	55.8	-	-	120	(40)
Group AB	-	-	-	-	-	-	6	100	6	(2)
Total	83	(27.7)	97	(32.3)	103	(34.3)	17	(5.7)	300	(100)

rate in group A mothers (41.9%) than in group B (30%) mothers is shown in the study. This is because Anti-B antibodies in group A mothers are low and less detrimental to fetal cells as compared to Anti-A antibodies in group B mothers which occur at higher levels and cause increased early foetal loss. Thus the net result is decrease in the number of full term incompatible fetuses in blood group B mothers (Table II).

readings explain low frequency of incompatible children born to group B mothers possibly due to high rate of elimination at foetal level. These results are in sharp contrast with the findings of Padma et al (1994) (Table III).

Anti-A titres were found to be slightly low than Anti-B titres in O group mothers in both compatible and

Table III Titres of ABO blood group antibodies in mother based on compatible and incompatible maternal foetal combinations.

Mothers Blood GP.	No.	Compatible Combination						Incompatible Combination						
		<1:8		1:16 to 1:128		> 1:256		<1:8		1:16 to 1:128		> 1:256		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Group B (Anti A)	70	24	34.3	40	57.1	6	8.6	25	-	-	10	40	15	60
Group A (Anti B)	43	16	37.2	26	60.5	1	2.3	25	-	-	22	88	3	12
Group O (Anti A)	67	22	32.8	41	61.2	4	6	53	11	20.75	36	67.9	6	11
(Anti B)	67	24	35.8	38	56.7	5	7.5	53	3	5.66	35	66.03	15	28

incompatible fetomaternal combinations explaining higher percentage of group A babies reaching full term than B group babies. Antibody titres were found in less concentrations in the cord blood than maternal blood.

Five new borns with ABO-HD were belonging to group O mothers (out of total 53 incompatible fetuses born to O group mothers) giving an incidence of 9.43%, ABO-HDNB in our study. Out of these five, 3 were primigravida, 1 was second and 1 was fourth gravida. High incidence of ABO incompatibility even in first born infant can be explained on the fact that this incompatibility arises due to naturally occurring immunoglobulins which will be present in even first pregnancy unlike the Rh incompatibility. Eighty percent of fetuses having ABO-HDNB were belonging to group A. Anti-A titres were very high i.e. upto 1:512 in mothers of these neonates while Anti-B titre was found elevated (1:256) than Anti-A titres in only one case. Jaundice appeared in all 5 babies within 24 hrs of the delivery, it appeared earlier in babies with high maternal antibody titres as compared to low titres. Not a single baby with HDNB required exchange transfusion while all of them were kept under observation.

2. Dhamgaye T.M, Gupta P.A, J. Obst. Gyn. Of India, 37:331;1993.
3. Gupte SC, Bhatia H.M, Purandare BM, J. Obst. Gyn. Of India, 23: 280;1973.
4. Jain PC, Bhala D, Singh SH, J. Obst. Gyn. Of India, 33:32;1983.
5. Nelson, "Test book of Paediatrics and Manual of Neonatal Care", 14th Ed.:486;1992.
6. Padma T, Veena TP, Vishnupriya S. J. Obst. Gyn. Of India, 44:240;1994.
7. Raha PK, Mitra AK, Ghosh M, J. Obst. Gyn. Of India, 27:889;1977.

Table IV Clinics pathological profile of 5 cases of ABO isoimmunization.

Case No.	Age in Yrs.	gravidity of Mother	Blood Group			Mode Of Delivery	Mother Antibody Titre		Time of Onset of Jaundice	Sex of Baby	Wt. in Kg.	Apgar Score
			Mother	Father	Baby		Anti-A	Anti-B				
1	28	4	O+	A+	A+	FTND	1.512	1.32	8 hrs	M	2.8 kg.	9-10
2	24	2	O+	A+	A+	FTND	1.128	1.64	24 hrs	F	2.6 kg.	10-10
3	18	1	O+	B+	B+	FTND	1.32	1.256	12 hrs	M	3 kg.	10-10
4	21	1	O+	A+	A+	FTND	1.512	1.64	10 hrs	M	3.4 kg.	9-10
5	20	1	O+	A+	A+	FTND	1.256	1.128	24 hrs	M	2.75 kg.	9-10

Case No.	S. Bilirubin - In Mg%		Hb. in Gm.	Observation or Phototherapy	Exchange Transfusion	Fetal Outcome
	Cord Bld	Max Conc in Mg%				
1	12.5	20.0	12	Phototherapy	Nil	Well
2	6.5	10.0	13.4	Observation	-	Well
3	7.2	12.0	12.6	Observation	-	Well
4	12.0	21.5	11.5	Phototherapy	-	Well
5	9.8	15.0	11.8	Phototherapy	-	Well

Phototherapy was required in 3 babies and all were discharged in good condition (Table IV).

References:

1. Desjandins L, Chintu, Zipursky, The J. Paed., 95:447;1979.