MATERNAL - FETAL ABO/RH. ANTIGENIC RELATIONSHIP WITH FETAL DEVELOPMENT

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SUMMARY

The aim of present study is to find out the immunological influence on physical development of the fetus. 200 primigravid women, 18-35 years of age, in labour were studied. Fetal outcome studied with different maternal-fetal blood group relationship, other variables affecting fetal development were kept identical. Mean birth weight (BW) was found significantly higher with fetal dominance, maternal fetal blood group incompatibility and fetuses with blood group "AB". Crown Heel Length (CHL) and Head Circumference (HC) were also significantly more with fetal dominance and incompatible blood groups.

INTRODUCTION

It is a well known fact that foetal development is not similar in all cases inspite of all the other factors known to affect fetal growth being identical. Genetic & racial factors play important role in it. Recently immunology is suggested to influence foetal growth. Animal studies have shown that foetal growth is faster where foetus is antigenically dissimilar to mother (Billington 1964) which may result from masking of trophoblastic alloantigens (Gill, 1979) or by generation of maternal supressor T cells.

In human being also pregnancy has been assumed to be associated with supression of a variety of humoral and cellular mediated immunological functions (Griffiths 1983) in order to accomodate the foreign semiallogenic foetal graft. Like other antigens maternal fetal blood group antigenic dissimilarity may also affect fetal growth. Very little work has been done in this field.

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This study is conducted to evaluate the effect of maternal & foetal blood group on the development of foetus.

MATERIAL AND METHOD

200 booked primigravidae with known LMP, admitted in labour to the Dept. of Obst. & Gynae, JLN Hospital, Ajmer were studied. Cases with medical and obstetrical comptications affecting fetal growth were excluded. All women were from middle socio-economic status. Blood grouping of mother as well as newborn was done. Birth weight, crown heel length and head circumference of newborn were recorded.

3. Maternal-fetal equivalence - Both having same number of antigens (antigenic vector score 0)

On the basis of maternal-fetal ABO compatibility cases were divided into three groups.

1. Compatible - Where mother and fetus were having same ABO blood group antigens (A-A, B-B, AB-AB, O-O)

2. Pseudo Compatible - Where fetus was having either no ABO blood group antigens or antigens common to mother (A-O, B-O, AB-O, AB-A, AB-B).

3. Incompatible - Where mother and fetus were having different ABO blood group antigens. (A-B, B-A, A-AB, B-AB, O-A/B/AB).

Table I

Blood Group	Antigen Score
A	1
B	1
AB	2
O	0
Rh + ve	1
Rh - ve	0

On the basis of the net difference in the number of ABO/Rh antigens between mother & fetus maternal-fetal units were divided into three groups. Table I

1. Maternal dominance - where mother has more number of antigens (antigenic vector score - 1)

2. Fetal dominance - Where the fetus has more number of antigens (antigenic vector score + 1)

RESULT

Table II - When relation of fetal weight, HC, & CHL is taken into consideration with maternal blood group alone, no significant change ($P>0.05$) observed with B.W. (o.068 Kg.), HC (0.36 cm) & CHL (0.66 cms)

Table II
BW CHL & HC IN RELATION TO THE MATERNAL ABO BLOOD GROUP

S.No.	Blood group	No. of cases	B.W. (kg)	Difference in birth wt.	P	CHL (cms)	Difference in CHL	P (cm)	HC (cms)	Difference in HC(cm)	P
1	A	66	2.853	1&4, 0.019	NS	48.95	1&4, 0.47	NS	33.85	1&4, 0.13	NS
2	B	47	2.862	2&4, 0.028	NS	49.06	2&4, 0.36	NS	33.71	2&4, 0.27	NS
3	AB	21	2.765	3&4, 0.069	NS	48.76	3&4, 0.66	0.05	33.62	3&4, 0.36	NS
4	0	66	2.834			49.42			33.98		

Table III
B.W. HC & CHL IN RELATION TO THE NEONATAL BLOOD GROUP

S. No.	Blood group	No. of cases	B.W. (kg)	Difference in birth wt.	P	CHL (cms)	Difference in CHL(cm)	P	HC (cm)	Difference in HC(cm)	P
1	A	60	2.745	1&4, 0.058	NS	48.99			33.72		
2	B	62	2.848	2&4, 0.045	NS	49.32	3&4, 1.62	<0.001	33.72	3&4, 0.94	<0.05
3	AB	20	3.184	3&4, 0.381	<0.381	50.21			34.72		
4	0	58	2.803			48.59			33.78		

when blood group 'O' was compared with blood group 'AB'.

Table III - When fetal blood group alone was taken into consideration increase in B.W. (0.381 Kg. P<0.001) HC (0.94 cms, P<0.05), CHL (1.63 cms, P<0.001) were significantly higher with blood group AB as compared to blood group 'O'.

Table IV - The mean birth weight, head circumference and crown heel length were significantly higher with maternal and fetal incompatible group.

Table V - Mean birth weight was significantly (P-0.02) higher (0.173 Kg) in fetal dominance as compared to maternal dominance. Increase in mean HC (0.7 cms). and CHL (1.5 cms) was highly significant from maternal dominance to fetal dominance (P<0.001).

DISCUSSION

Foetal growth is a complex process which is influenced by many medical & racial factors. In diabetic mothers babies are larger while in PIH they are small for date. Growth of foetus is more in whites than in blacks. It has also been seen that babies of short stature mothers are small in size. It is observed

Table IV
BW,HC & CHL IN RELATION TO MATERNAL FETAL ABO COMPATIBILITY

S.No.	Group	No.of cases	B.W.(kg) mean	Difference in birth wt.	P	HC(cms) mean	Difference in HC.(cm)	P	CHL(cms) mean	Difference in CHL(cm)	P
1	A-A B-B, O-O AB - AB	97	2.814	1&2, 0.064	NS	33.74	1&2, 0.17	NS	48.86	1&2, 0.42	<0.05
2	Pseudo compatible A-O,B-O,AB-O AB-A, AB-B	45	2.750	1&3,0.127	<0.05	33.57	1&3, 0.48	<0.01	48.44	1&3, 1.18	<0.001
3	Incompatible A-B, B-A, A-AB,	58	2.941	2&3, 0.191	<0.05	34.22	2&3, 0.65	<0.001	50.04	2&3, 1.10	<0.001

Table V
BW, HC & CHL IN RELATION TO ANTIGENIC VECTOR SCORE

S.No.	AVC cases	No. of	B.W.(Kg) mean	Difference in birth wt.	P	HC(cms) mean	Difference in HC(cm)	P	CHL(cms) mean	Difference in CHL(cm)	P
1	-1	46	2.769	1&2, 0.053	NS	33.54	1&2,0.20	NS	48.44	1&2,0.47	<0.05
2	0	94	2.822	2&3,0.120	<0.50	33.74	2&3,0.50	<0.001	48.91	2&3,0.93	<0..001
3	+1	60	2.942	1&3,0.173	<0.02	34.24	1&3,0.70	<0.001	49.94	123,1.50	<0.001

that even when all factors are similar in all respects the growth of foetus is variable.

In the study maternal - fetal ABO/Rh antigenic relationship has shown the increase of mean B.W. to 0.173 Kg (P<0.02) and of mean CHL to 1.50 cms (p<0.001) from maternal dominance to fetal dominance. Results are comparable with study of Hoff & Bixler (1986) where birth weight was increased to 60 gms and CHL to 0.8 cms. compared to the observation of Hoff & Bixler (1986) mean HC was increased to 0.7 cms (P<0.001) in the present study (Table V).

When maternal blood group alone was taken into consideration the mean B.W. was lowest with blood group AB but the difference between various groups was not significant. CHL & HC increased significantly from blood group AB to O (P<0.05) (Table II). This is because of more likelihood of having antigenically dissimilar fetus in blood group 'O' mothers.

Considering neonatal blood group alone increase in B.W. (o.381 Kg.), HC (.94 cm) and CHL (1.62 cm) were observed with blood group AB. (Table III). Neonates with blood group AB are more liable to be antigenically dissimilar to group 'A', 'B' & 'O' mothers.

Billington (1964)and James (1965) conducted studies on mice and had shown that greater the degree of antigenic dissimilarity between the blastocyst and the mother, faster the rate of fetal and placental growth. They also suggested that it may be due to masking or removal of trophoblastic alloantigens by maternal Ig-G blocking antibodies which are able to cross the placenta and facilitate the growth of antigenically foreign cells like fetal cells. (Gill 1979, Beer et al 1981).

Gill (1979), is of the view that immunosupression removes some of the constraints placed by maternal immune system on fetal growth and thus promotes fetal growth. Alternatively immune agents may act directly as growth promoter or growth promoting factors are produced as a by product of immunosupressive events.

Mean B.W. increased significantly from compatible and pseudocompatible to incompatible group (P<0.05) and highly significant increase in mean HC & CHL from compatible to compatible group was noticed (P<0.001) in the present study (Table IV). Contrary to it Seppala (1970) did not find any correlation of B.W. with these groups.

CONCLUSION

Fetal growth is greater with fetal dominance (antigenic vector score +1) as compared to other maternal fetal blood groups. It suggests that maternal - fetal ABO/Rh group influences fetal growth. However more study is required in this field to understand the immunological process in other.

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