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EFFECT OF MATERNAL ABO BLOOD TYPE ON BIRTH WEIGHT

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ABSTRACT

Background*: ABO blood group has been recognized as a risk factor for distinct disease states. The association between ABO blood group and adverse pregnancy outcomes has not been extensively studied, especially in relation to birth weight. The aim of the present study is to determine whether ABO blood group contributes to the adverse pregnancy outcomes like low birth weight.*

Methods*: Medical data including ABO phenotypes were collected from hospital database and retrospectively reviewed. Adverse pregnancy outcome studied was low birth weight. Birth week was also noted for each subject.*

Results: *500 charts of mothers who had given birth in our hospital were studied. Overall 146 (29.2%) women had type O blood, 108 (21.6%) had type A blood, 194 (38.8%) had type B blood and 52 (10.4%) had type AB blood. Pregnant women with type B blood group had significantly lower birth weights compared with type O, A and AB. Birth weeks of all groups were found to be similar with no statistically significant difference*

Conclusions: *Maternal ABO phenotype is associated with low birth weight, while no association was found between blood type and birth week. We postulate that maternal/fetal immune system genes which are directly associated with ABO blood groups could affect pregnant with a resulting birth weight alterations.*

KEYWORDS: *ABO blood type, Birth weight, Pregnancy.*

I.INTRODUCTION

Various studies have shown a strong association between ABO blood groups and increased susceptibility to certain disease conditions including cardiovascular events, viral or bacterial infections, colorectal cancer, intracranial aneurysm and thromboembolic diseases. [1-4] Moreover, the relation between ABO blood type and adverse pregnancy outcomes has also been reported in literature including preeclampsia (PE), chorioamnionitis, venous thromboembolism and post-partum haemorrhage.[5] Unfortunately, controversies have arisen among these studies that have reported a possible relation between blood types and pregnancy outcomes.

ABO blood group antigens (namely, A, B, AB and O) which have been discovered nearly a century ago is expressed on the surface of a wide range of

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human cells and tissues. [5,6] The blood group of a person depends upon the presence or absence of two genes A and B. Both the A and B alleles encode slightly different versions of the enzyme glycosyltransferases that produce both A and B antigens. The O allele encodes an inactive glycosyltransferase that leaves the ABO antigen precursor unmodified. These antigens exist in different cell and tissue systems including red blood cells (RBC), vascular endothelium, epidermis, platelets, and neurons.[7,8] Because of this wide range of expression, ABO blood group antigens constitute an intriguing field of research outside the area of transfusion and transplantation medicine including the area of reproductive medicine. Preliminary studies suggest that ABO blood type of pregnant women is an independent risk factor for adverse pregnancy outcomes.[9,10]

Adverse pregnancy complications including Pre Eclampsia, preterm birth and delivery of low birth weight (LBW) babies represent a major global public health concern. Although these complications generally depend upon the underlying maternal medical conditions such as poorly controlled blood pressure and diabetes, fetal and placental factors can also be responsible from this fetal complication.[11] In this context, LBW is one of the most intractable and yet clinically relevant complication affecting human pregnancies with an increased neonatal mortality and morbidity rates. Regardless of gestational age, LBW is defined as a birth weight of a live born infant of 2500 g or less. LBW babies are significantly at risk of death, contributing to the high perinatal morbidity and mortality. [12] Despite a great number of risk factors that is known to be associated with LBW, in 40% of cases the exact mechanisms causing LBW are not known. [13] Based on the association between ABO blood group and adverse pregnancy outcomes, we hypothesized that blood group antigens may be responsible for the pathogenesis of LBW babies. Therefore, the goal of this study was to evaluate ABO blood types with common adverse pregnancy event like LBW and preterm delivery.

II. METHODOLOGY

This retrospective study was conducted in the Department of Pediatrics at Northern Railway Central Hospital , New Delhi. After the approval from the Institutional Ethics Board, we used the hospital's database which contains details on demographic and clinical variables for both mothers and neonates. We retrospectively analyzed 500 women who had given birth in our hospital between June 2020 and December 2020. Only mothers with documented ABO blood group were included in the present study. Women having a history of any drug use (except for vitamins, iron and folate), multi-fetal pregnancy, erythroblastosis fetalis were excluded from the study. Regardless of gestational age, LBW was defined as weight at birth <2500 grams. The gestational age at birth was classified as term (≥37 weeks) and preterm (≤36+6 weeks). Statistical analysis was done with SPPS version 22.

III. RESULTS

A total of 500 pregnant women included in the present study. Mean age of study participants were 24.8±3.4. Mean age of the study participants according to ABO blood groups are presented in Table 1. The most common blood type detected in our study group was type B positive (37.0%).

Table-1: ABO blood types of study participants.

Blood Group	N	%
A+	102	20.40
A-	6	1.20
B+	185	37.00
B-	9	1.80
O+	137	27.40
O-	9	1.80
AB+	50	10.00
AB-	2	0.40
Total	500	100

194 out of 500 pregnants had type B blood, 146 had type O blood, 108 had type A blood and 52 had type AB blood. Mean birth weight and birth week of pregnant women are given in Table 2. Pregnant women with type B blood group had significantly lower birth weights compared with type O, A and AB. Birth weeks of all groups were found to be similar with no statistically significant difference.

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Table 2: Birth week and birth weight according to blood groups.

	Blood Group				
Mean of	**O (n=146)**	**A (n=108)**	**B (n=194)**	**AB (n=52)**	**p value**
Birth wt. (gm)	2960	3021	2774	2996	<0.00001 *
Birth week	38.5	38.3	38.1	38.3	Not significant

*B blood type versus O, A and AB blood type.

9.58% pregnant women with O group, 6.48% with A group, 18.04% with B group and 7.69% pregnants with AB group had LBW babies. (Table 3). LBW babies were significantly higher in mothers with B blood group ($p<0.005$)

Table 3: Low birth weight babies (<2500 grams) according to maternal ABO blood group

	Blood Group	N	%
Low Birth Weight	**O**	14/146	9.58
	A	7/108	6.48
	B	35/194	18.04
	AB	4/52	7.69

IV.DISCUSSION

Several lines of evidence had previously suggested a possible association between ABO blood group and risk of adverse pregnancy outcomes including Low birth weight,Pre Eclampsia, chorioamnionitis, and venous thromboembolism. [5,6] Despite potential pathophysiological mechanisms and pathways which have been put forward to explain these associations, many conflicting results still awaits resolution. This study is performed in order to understand the existing knowledge and to fill the gap in this area. The main finding of the present study is to show that type B blood group is associated with LBW in pregnant women with no associated disease. Although no literature data exists regarding the association between ABO blood groups and birth weight, it is believed that ABO blood group antigens attached to cell surface glycoconjugates play many important roles in immune and coagulation systems. Moreover, particular combinations of maternal/fetal immune system genes which are directly associated with ABO blood groups could affect pregnants with a resulting birth weight alterations. In addition, fetal growth in uterus partially depends on the maternal blood supply to the placenta which necessitates structural modifications of the uterine spiral arteries. Therefore, the causative role of non-O blood type in arterial thrombosis may put a pregnant at a specific risk according to her inherited blood group antigens during pregnancy.

We admit some limitations of this analysis. Firstly, this is a retrospective study which includes a cohort from a single academic center. Second, we didn't analyse the association between ABO blood group and other adverse pregnancy outcomes such as pre eclampsia , chorioamnionitis, venous thromboembolism and gestational diabetes mellitus. And finally, missing data in this retrospective study may have weakened the association of the variables examined in this study.

V.CONCLUSION

In conclusion, we have to say that there is a potential association between ABO blood groups and birth weight which needs to be further investigated by prospective randomized trials.

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