EFFECT OF MATERNAL ABO BLOOD TYPE ON BIRTH WEIGHT

Dr. Himanshu S Dave1
1 DNB Pediatrics Resident, NRCH, New Delhi

Dr. Tanushree Joshi2
2 HOD, Department of Pediatrics, NRCH, New Delhi

Dr. Kathakali Das3
3 Senior Consultant, Department of Pediatrics, NRCH, New Delhi

Dr. Dimple Pal4
4 DNB Pediatrics Resident, NRCH, New Delhi

Corresponding author: Dr. Himanshu S Dave,

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...
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 SPSS 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%).

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

| Blood Group | Mean of Birth wt. (gm) | Mean of Birth week |
|-------------|------------------------|--------------------|
| 0 (n=146)   | 2960                   | 38.5               |
| A (n=108)   | 3021                   | 38.3               |
| B (n=194)   | 2774                   | 38.1               |
| AB (n=52)   | 2996                   | 38.3               |

*p value

*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% pregnant 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       | %      |
|-------------|---------|--------|
| 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 which needs to be further investigated by prospective randomized trials.

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.

VI. REFERENCES

1. Shavakhi A, Hajalikhani M, Minakari M, Norian A, Riahi R, Azarnia M, et al. The association of non-O blood group and severity of liver fibrosis in patients with chronic hepatitis C infection. J Res Med Sci. 2012;17(5):466–9.
2. Khalili H, Wolpin BM, Huang ES, Giovannucci EL, Kraft P, Fuchs CS, et al. ABO blood group and risk of colorectal cancer. Cancer Epidemiol Biomarkers Prev. 2011;20(5):1017-20.
3. Bir SC, Bollam P, Nanda A. Distribution of ABO blood groups in the patients with intracranial aneurysm and association of different risk factors with particular blood type. Asian J Neurosurg. 2015;10(3):153-7.
4. Wu O, Bayouni N, Vickers MA, Clark P. ABO(H) blood groups and vascular disease: a systematic review and meta-analysis. J Thromb Haemost. 2008;6(1):62-9.
5. Franchini M, Mengoli C, Lippi G. Relationship between ABO blood group and pregnancy complications: a systematic literature analysis. Blood Transfus. 2016;14(5):441-8.
6. Hosoi E. Biological and clinical aspects of ABO blood group system. J Med Invest. 2008;55(3-4):174-82.
7. Dentali F, Sironi AP, Ageno W, Crestani S, Franchini M. ABO blood group and vascular disease: an update. Semin Thromb Hemost. 2014;40(1):49-59.
8. Franchini M, Lippi G. The intriguing relationship between the ABO blood group, cardiovascular disease, and cancer. BMC Med. 2015;13:7.
9. Phaloprakarn C, Tangjitgamol S. Maternal ABO blood group and adverse pregnancy outcomes. J Perinatol. 2013;33(2):107-11.
10. Seyfizadeh N, Seyfizadeh N, Yousefi B, Borzoueisileh S, Majidinia M, Shanehbandi D, et al. Is there association between ABO blood group and the risk factors of unfavorable outcomes of pregnancy? J Matern Fetal Neonat Med. 2015;28(5):578-82.
11. Barden A. Pre-eclampsia: contribution of maternal constitutional factors and the consequences for cardiovascular health. Clin Exp Pharmacol Physiol. 2006;33(9):826-30.
12. Shinwell ES. Neonatal morbidity of very low birth weight infants from multiple pregnancies.
13. Khan NS, Ashraf RN, Noor S, Rahman M, Mashhadi SF, Rashid Z, et al. Association of Maternal Periodontitis with Low Birth Weight in Newborns in a Tertiary Care Hospital. J Ayub Med Coll Abbottabad. 2016;28(1):120-5.