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Research Article

The relationship between maternal blood group and preeclampsia

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ABSTRACT

Background: Pre-eclampsia is a pregnancy specific, multisystem, hypertensive disorder characterized by new onset hypertension and proteinuria after 20 weeks of gestation and remission of signs after delivery, which is the leading cause of maternal, fetal and neonatal mortality and morbidity. Despite extensive research, the etiology and pathogenesis of Pre-eclampsia remain obscure and poorly understood. ABO blood groups are known to be associated with many disorders. In this study we have tried to know the relationship between maternal blood group and preeclampsia.

Methods: It is a cross-sectional study. 100 pregnant women with preeclampsia and 100 women with normal pregnancy were selected. Rh negative females or women with any other medical and surgical complication were excluded from the study. Using blood group O as the reference group, the relation between maternal blood group and preeclampsia was estimated using odds ratios and 95% confidence intervals from logistic regression models.

Results: When compared with blood group O, women of blood group AB have an increased risk of preeclampsia.

Conclusions: The present study indicates that AB blood group have the highest risk of developing preeclampsia. AB blood group is associated with an increased risk of thrombotic events this may be the cause of increased incidence of PIH in this group. Thus attention should be given to the AB blood group pregnant women in order to prevent the PIH.

Keywords: ABO blood groups, PIH, Pregnant women, Preeclampsia

INTRODUCTION

Women die as a result of complications during and following pregnancy and childbirth. Most of these complications develop during pregnancy. The major complications that account for nearly 75% of all maternal deaths are severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy, complications from delivery unsafe abortion.¹ In India, roughly one maternal death occurs every five minutes.² Hypertensive disorders complicating pregnancy are common and form one of the deadly triad, along with haemorrhage and infection, that results in much of the maternal morbidity and mortality related to pregnancy. How pregnancy incites or aggravates hypertension remains unsolved despite

decades of intensive research, and hypertensive disorders remain among the most significant unsolved problems in obstetrics.³ Preeclampsia is a multisystem disorder of unknown etiology characterised by development of hypertension to the extent of 140/90 mm Hg or more with proteinuria after the 20th week in previously normotensive and non-proteinuric patients.⁴ Pre-eclampsia is a complex pathophysiological state where regulatory systems of inflammation and endothelial function are stimulated beyond the physiological limits of normal pregnancy.⁵ Though there is genetic susceptibility, the pathogenesis of pre-eclampsia has been enigmatic.^{6,7} There is increased association of preeclampsia with the following: primigravida, rhesus incompatibility, diabetes, genetic disorders, pre-existing vascular and renal diseases, thrombophilias raised body mass index before pregnancy

etc.⁵ The antigens of ABO blood-group are oligosaccharides that are attached to the cell-surface glycoconjugates and are expressed by epithelia, endothelia and erythrocytes (RBCs) in primates. Susceptibility to diseases such as infections, cancer, cardiovascular diseases and hematologic disorders are found to be associated with ABO blood groups. It is a key determinant of coagulation factor VIII and von Willebrand factor plasma concentrations.⁸ ABO antigens may alter the presentation of cell-surface glycans and modulate their interactions with pathogens or may provide receptors for pathogen attachment, hence ABO antigen is associated with various diseases. ABO antigens may play a major role in the interaction of the immune and coagulation systems by influencing gene-environment interactions. As the current view on preeclampsia suggests that it has an exaggerated maternal systemic immune response component and characteristic changes in coagulation systems, differences in ABO blood groups may increase the risk of disease according to the inherited antigens.

METHODS

This cross sectional study was conducted at Navodaya medical college. Institutional ethical clearance was taken. An informed consent was taken from every patient after full explanation of procedure. The subjects for the study were selected from the out-patient and in-patient department of obstetrics and gynaecology and also from the labour room. 100 pregnant women who were fulfilling the criteria for preeclampsia were considered as cases and 100 women with normal pregnancy without any complications were selected as controls. Only Rh positive primi cases were included in the study. Subjects having any other medical and surgical complication and women having history of any drug use, multi-fetal pregnancy, Rh negative blood group subject smoking, erythroblastosis fetalis, were excluded from the study. Relevant past and personal history from the subjects are taken. General physical examination, vital signs were recorded. A drop of blood was taken from their finger tip using lancet, under aseptic precaution. 1 drop of blood was mixed with 1 ml of normal saline in a test tube. This provided the red cell suspension. Blood group was determined by haemagglutination technique. A drop of monoclonal Anti A, Anti B, Anti D was added separately on a clean glass slide and to each of this a drop of red cell suspension was added. With separate applicator, the serum was well mixed back and forth and observed for agglutination and it was confirmed under low power objective. Results of agglutination were recorded immediately for ABO blood group and after 2 minutes for Rh. The proteinuria was measured by urine dipsticks.

Statistical Analysis

The data were analyzed by using Microsoft Excel and Epiinfo. The relationship of blood group with

preeclampsia was estimated by calculating odds ratio from logistic regression models using blood group O and controls respectively as reference group after adjustment for various covariates. A p-value of <0.05 was considered as statistically significant.

RESULTS

The study population consist of 100 cases and 100 controls. Using blood group O as the reference group, the association between blood group and preeclampsia was estimated using odds ratios and 95% confidence intervals from logistic regression models. The results as shown in table- 2 indicated that AB has the highest, and O has lowest risk for PIH among the ABO blood groups.

Table 1: Showing the distribution of different blood groups in both categories.

Category	Blood group (%)				Total
	A	B	AB	O	
Cases	10 (10)	12 (12)	50 (50)	28 (28)	100
Control	16 (16)	24 (24)	6 (6)	54 (54)	100

Table 2: Showing the association between ABO blood group and PIH.

Blood groups	Odds ratio	95% confidence limit		Significance (P value)	
		Lower bound	Upper bound		
A	1.205	0.48	3.99	0.87	NS
B	0.964	0.42	2.21	0.931	NS
AB	16.07	6.14	42.07	<0.0001	HS

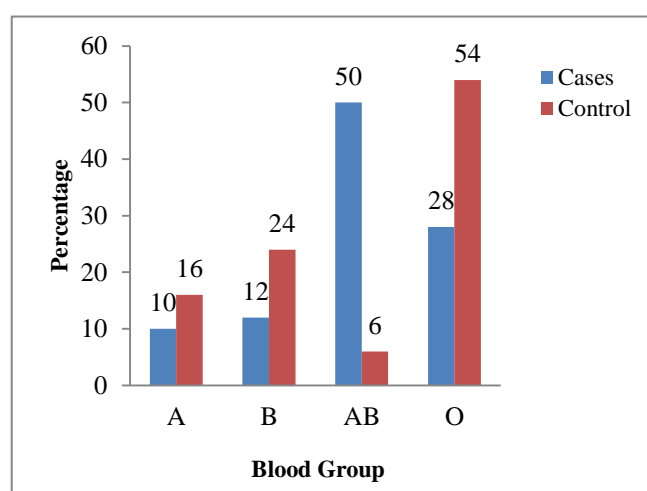


Figure 1: Distribution of different blood groups in both categories.

The reference category is: blood group O

DISCUSSION

The results of our study indicate that women with blood group AB have the highest risk for preeclampsia compared to other blood group. Preeclampsia, a syndrome unique to human pregnancy and one of the leading causes of maternal and foetal morbidity and mortality, is also associated with maternal blood group. Patients with blood group AB have an increased risk of severe, early-onset, or intrauterine growth restriction (IUGR) associated forms of preeclampsia.⁸ The results of our study are consistent with findings of Lee BK et al⁹ Bharali et al¹⁰ Spinillo et al¹¹ C Phaloprakram et al.¹² One suggested mechanism of how blood group influences the risk of gestational hypertensive disorders is through the maternal immune response. Placental Protein¹³ (PP13) is considered to be an early marker for preeclampsia. PP13 is primarily produced by the placenta in anthropoid primates. It is a galectin (galectin-13) that binds beta-galactosides, such as N-acetyl-galactosamine, galactose, fucose, located at terminal positions on ABO blood-group antigens, with strongest affinity to blood group AB.⁸ In women from AB group, the close proximity of A and B antigens could explain the stronger binding of PP13 to blood group AB erythrocytes, leading to its sequestration. In consequence the PP13 plasma levels are low in pregnant on the first trimester of gestation, which could predispose pregnancy complications, including preeclampsia.¹³ Compared with O group, A, B, and AB groups are associated with an increased risk of thrombotic events, although this relationship is debated. ABO blood groups may differ in the occurrence of known vascular risk factors for preeclampsia, such as endothelial dysfunction¹⁴, insulin resistance,¹⁵ and hypercholesterolemia.¹⁶ ABO blood group is a key determinant of coagulation factor VIII and von Willebrand factor plasma concentrations. Low plasma concentrations of these glycoproteins in blood-group O individuals may lead to excess bleeding, while elevated plasma concentrations of these factors in non-O blood-group individuals have been implicated in increasing the risk of thromboembolic and ischemic heart diseases.⁸ Recent genome-wide association studies indicate that genetic variants at the ABO locus are associated with soluble E-selectin,^{17,18} P-selectin, and ICAM-1,¹⁹ vascular inflammatory agents that are associated with hypertension and type-2 diabetes.²⁰ However, of a diverse panel of inflammatory biomarkers, including E-selectin, P-selectin, and ICAM-1, a recent study found that only E-selectin levels were higher in preeclampsia cases versus controls.²¹

CONCLUSIONS

The results of this study suggest relationship between ABO blood group systems and PIH preeclampsia with AB blood group women having highest risk. Considering the role of ABO blood groups on the hemostatic process and thrombus formation, special attention should be

given to pregnant patients carrying the AB blood group in order to prevent the preeclampsia and improve prognosis.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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